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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS, AND BLACKSMITHS.

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Blessing's Pump Governor.

The inventor of this device is also the inventor of the well-known return steam trap for returning, under pressure, the water of condensation to the boiler. Soon after the introduction of this trap the necessity of another method in special cases was seen, as where the pressure in the heating system was greatly reduced below the boiler pressure, or where the distance of the trap above the boiler was less than 30 inches, the capacity of the trap was materially reduced. The outcome of experiments in this direction has been the production of several arrangements for the purpose, and finally that shown in the engravings which we produce with this.

By way of explanation it may be said that a pump governor for the purpose intimated is a mechanical device used in connection with a steam pump, and which so controls the action of the pump that its piston speed shall not exceed, but shall be in exact proportion to, the quantity of water in the condensing system, working rapidly or slowly as a larger or smaller amount of heating surface is used, finally stopping when all the surface is shut off; then, there being no water to reach the pump, it should perform this work equally well whether the water and steam have the pressure and temperature due to 1 or 100 pounds above the atmosphere.

Old practice in this respect was to trap the water into a tank having a vapor or waste pipe connected with its upper side, allowing the steam above 212°, and the heat in it to escape into the atmosphere. The temperature being still above the capability of the pump to handle, a pipe known as a mixing pipe, introducing cold water was resorted to. This necessitated the use of an over-flow pipe, usually connected to the tank at about two-thirds the distance from the top to the bottom. The pump taking its supply from the bottom of the tank, the cold water from the mixing pipe found its way there by its superior gravity, while the hot water went to waste through the over-flow.

It is obvious that to save the great waste of heat lost in the above described plan the device for the purpose must be one that can be used in connection with any of the ordinarily constructed steam pumps, whether direct-acting or crank and fly-wheel; it should be so arranged that it can be used on the same level, or even lower than that of the pump; it must have means of automatically relieving itself of the air constantly accumulating from the heating pipes; it must be so constructed as not to be liable to derangement, as it may be required to work under pressures from 1 to 100 pounds; it should be small so that excessive surface will not cause loss from exposure. The more rapidly the water is returned to the boiler, the less the loss of heat.

In the engravings representing this device, Fig. 1, in section, represents a closed vessel containing one within it, which is termed a movable bucket, having screwed into its bottom a short piece of pipe which serves as a guide for the same as it rises and falls, and also as an exit pipe to allow the water to pass from the bucket on its way to the pump.

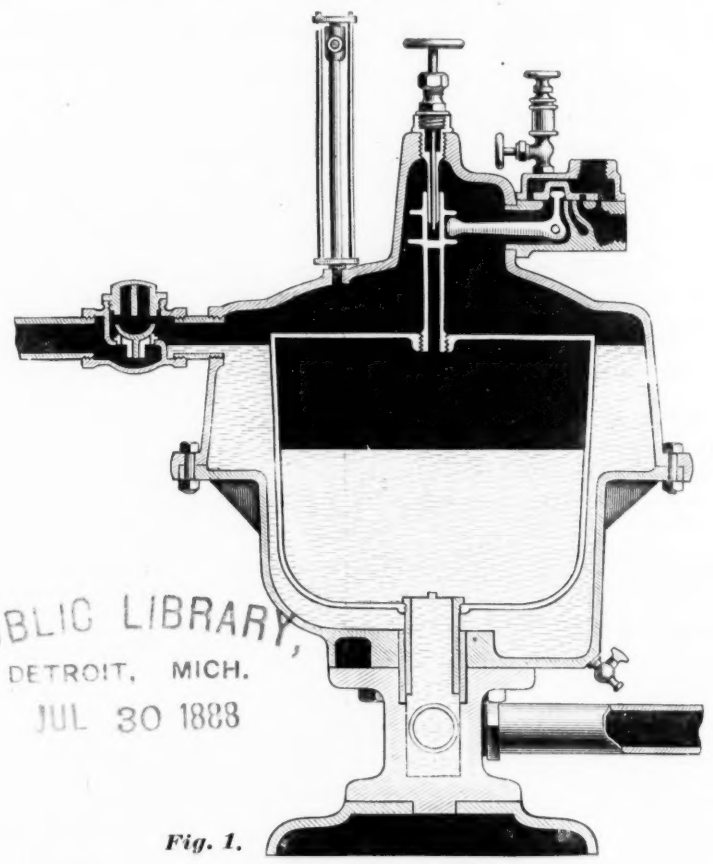

Fig. 1.

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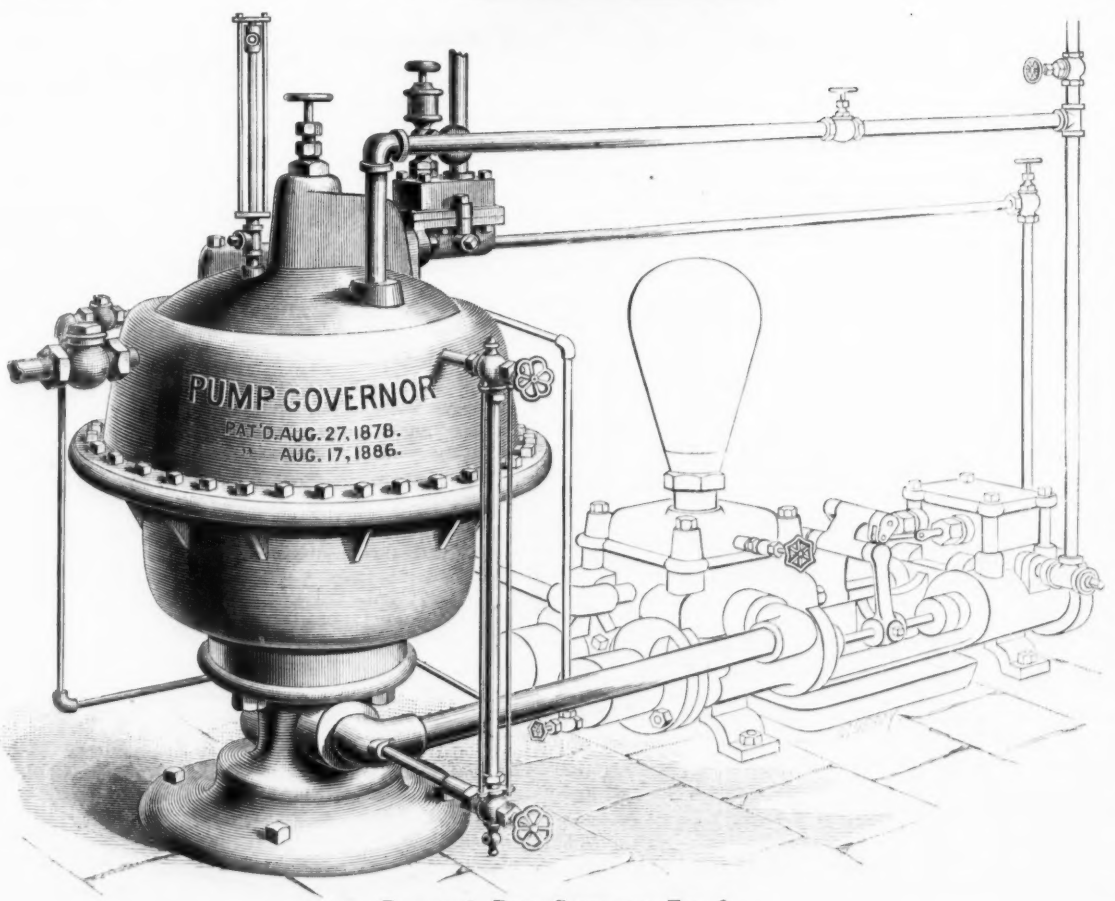
On the upper right hand side of the governor a slide valve will be seen for supplying the pump with steam; this valve is in a small steam chest into which the steam from the boiler is first introduced. The face on which this valve slides contains three openings or ports, two of them being in connection with each other and leading thence into the chamber to which the steam pipe is connected that conveys the steam to operate the pipe, while the other port is considerably smaller than the two just mentioned. When the bucket is at its highest position the valve will be at its extreme point to the right, closing the first two ports and leaving the third one open to a passage under the valve from the interior of the governor to the atmosphere. The valve is caused to move over the ports by the rising and falling of the bucket through the intervention of a bell-crank lever. One end of this lever passes up through the valve seat and projects a short distance above the face on which the valve slides, and into a small pocket formed in the under side of the valve to operate the same. The other end of this lever is connected with the movable bucket through the intervention of two collars, one above the other, cast on the hollow pipe or stem which guides the bucket, leaving a space between them into which plays this end of the bell-crank lever as the bucket rises or falls, while at the same time permitting the bucket to freely revolve. By this construction the use of stuffing boxes is avoided, since the boiler pressure steam is contained in the small chest covering the valve, and the bell-crank lever is working in such space and directly in the interior of the governor.

Near the upper left hand side and connecting with the outer case is a check valve opening towards the interior of the governor. On the extreme top of the governor is a hand wheel having a threaded stem for the purpose of adjusting the rising of the bucket by preventing it reaching a point so high that it will entirely close the steam ports, and thereby cause the pump to continue operating at a slow speed.

On the cover of the governor is the usual automatic air valve, which allows any excess of air to escape through it.

In the hollow pedestal, supporting the governor, is shown the opening for the exit of the water on its way to the pump. The operation is as follows:

The space between the bucket and outer case must first be filled with water by either pouring it through the hand hole on the top of the governor (which does not appear on the engraving) or by the water running in from the system of heating pipes; the valve, however, that admits the steam to the steam chest must first be closed until this space is once filled, for the condition of the apparatus is such that when there is no water in this space the bucket will be necessarily in its lowest position, and consequently the two ports for admitting steam to the pump will be wide open, and the pump will at once commence racing, since there will be no water present for the pump to act on. Now, this space having been filled with water and the bucket in its highest position, the two steam ports being closed, and the pump at a state of rest,



BLESSING'S PUMP GOVERNOR—FIG. 2.

the introduction of the water of condensation through the check valve in the receiving pipe shown on the left hand side of the governor, flowing over into the bucket, will cause it to descend when it has received within it a sufficient quantity of water to overcome the floating power of the water surrounding it; in descending it will, through the intervention of the bell-crank lever, cause the slide valve to be moved towards the left, opening thereby the steam ports for admitting the passage of the steam from the steam chest to the pump, which will start the pump in operation.

If the pump is of a capacity greater than the supply it will, after a few strokes, take water from the bucket enough to so lessen its weight that the surrounding water will float it upwards and cause the slide valve to move to the right, thus closing the steam ports and stopping the pump's operation until a sufficient amount of the water of condensation shall have been received anew into the bucket to cause it to descend and again operate the pump. This operation continues on repeating itself.

Should the pump employed be of a construction known as a crank pump it must be kept in slow continuous operation lest it might stop on its center and thus require the presence of an attendant to start it again in operation. To avoid this the wheel with the threaded stem or shaft seen on the top of the governor has been introduced, which when screwed down to the proper point forms a stop, preventing the full rise of the bucket, and leaving thereby the two steam ports partly open to secure continuously the operation of the pump.

The governor can be operated in several different ways, the one selected for explanation being what is commonly known as the reduced pressure system. Referring to the pumps, it will be seen that there are three exhaust pipes from the pump, one to the top of the governor, one to the main steam pipe, and one to the atmosphere. Suppose a case of steam-heating in which the pressure is reduced from, say, 80 pounds above the atmosphere to five pounds. It is a well-known fact that in order to pump water at a temperature of 212 degrees there must be some pressure upon it to force it into the pump, and a plan has been resorted to, independent of the governor, of elevating the tank containing the water to be pumped to a height sufficiently above the pump to allow the water in the tank to flow by gravity pressure into the pump. This is accomplished, however, through the intervention of the governor in the following manner: Steam being admitted into the system through the reducing valve at a pressure of five pounds above the atmosphere and finally supplied to the different radiators, the water of condensation will in time find its way down to a small tank, supposed to be located to the left in the engraving, filling the tank, and thence overflowing through the receiving pipe and check valve into the governor which will start the pump in operation. The governor and pump being on the same level, and there being no pressure on the water, the pump will not take the water for the first few strokes, and it is at this moment when the advantage of one of the three different ways of exhausting the steam from the pump appears, for if the valves in the pipe of the other two ways of exhausting (shown in the drawing) were closed and the pump were exhausting through the pipe leading into the top of the governor, the exhaust steam would at once create on the surface of the water in the governor a pressure great enough to force it into the pump, the check valve on the receiving side opening toward the governor seating itself and preventing the pressure escaping back into the drip-pan. Under the circumstances described the pressure caused by exhausting the steam from the pump into the governor rarely ever exceeds ten pounds, because the pump has only to make a few strokes when the water is exhausted from the bucket, and the pump will have been stopped by the closing of the steam ports. At this moment the pressure in the governor, from the exhaust steam introduced into it, as before described, may be ten pounds or less, but as there is little or no pressure on the water in the drip-tank it might occasion too much loss of time to wait for the pressure in the governor to become reduced enough by condensation to admit the water therein. It is at this juncture that the third steam port comes into use. As before explained when the valve was in a position to close the other two ports, this one would be open to the atmosphere. Now the valve being in this position the pressure in the governor will be exhausted into the atmosphere, when the water from the tank will again begin to enter the governor causing it to continue repeating its operation. When the governor is not to be used as exhausting to the atmosphere the opening on the side of the valve may be closed with a globe valve (not shown in drawing).

In using the governor on a system where the pressures are not reduced as low as five pounds, or in other words where there is a sufficient pressure on the return water to force it into the pump, the last explained use of the exhaust pipe is not needed, since the one connecting directly with the main steam can be used. If the pressures in the system and boiler are nearly equal, then the one exhausting into the atmosphere must be employed.

The manufacturers of this governor are the Albany Steam Trap Company, Albany, N. Y.

Railroads that Won't Carry Cheap Coal.

A press dispatch from Chicago says:

"Agents of the Knights of Labor have circulated a paper among the commercial and manufacturing men here by which the signers agree to buy coal of the Knights, provided the latter furnish it at rates from $1 to $1.50 per ton lower than those made by the coal ring. This document has been signed by about 600 of the leading consumers of the city. The Knights are relying upon co-operative shafts at Cannelburg, Ind., and in St. Clair County, Ill., purchased by the General Executive Board of the Knights last year. The capacity of these mines is 30,000 tons per day. All arrangements were made to begin marketing coal here on the 1st inst. Only one difficulty was encountered, but that has been insurmountable. It is alleged that the Ohio & Mississippi Railroad refuses to carry more than one car load per day for the Knights, and the Illinois Central declines to carry any coal whatever. Evidence is now being taken by a special committee of the State Executive Board concerning a conspiracy against their mines, said to exist between the railroads, coal operators and the banks. The recently elected labor representatives, will, it is announced, bring the evidence before the State Legislature. A part of the evidence consists of affidavits and letters. The advisability of taking legal measures to compel the roads to carry the coal is under consideration."

A machinery dealer sold an engine and boiler to a party in Georgia under an agreement reserving title and ownership in the seller until the whole purchase price should be paid. This was supposed to be a very safe transaction, but as the property was destroyed by fire, and as the Supreme Court of Georgia has decided that in the absence of negligence on the part of the buyer the risk was wholly that of the seller, that machinery dealer has lost faith in the security of such contracts.

Mr. Leyshon Jones, formerly manager of the Wallaroo Copper Smelting Works, South Australia, claims to have discovered a method by which copper plates can be permanently attached to iron. He has exhibited in Adelaide a piece of plate iron, $\frac{3}{4}$ inch thick, with a copper plate firmly adhering to it by means of a preparation like cement, discovered by Mr. Jones. On the other side of the iron there is a layer of this preparation, which sticks to the plate as if it were part and parcel of the original metal. The plate has been submerged in the sea for a period of nine weeks, and there is no visible sign of the preparation wearing away, or of the copper losing its hold of the iron.—*American Artisan.*

Condition and Prospects of the Machinery Business.

LETTERS FROM PROMINENT ESTABLISHMENTS TO THE "AMERICAN MACHINIST."

The Brown & Sharpe Manufacturing Company (Machinery and Tools), Providence, R. I., write us:

Business in most of our lines has been much better during this year than in 1885. The works have been run ten hours per day, and 48 machine tools added to the plant. Commencing the year with 465 hands, the number has been gradually increased till 614 are now employed. As anticipated in letter written you a year since, the reduction in prices of our "Universal Milling Machines" has led to an increased demand. By making them in lots of 100 with special tools, we have been enabled to attain much greater accuracy than heret fore, and at the same time to reduce their cost. It is our intention to pursue this system of manufacture, the carrying out of which will probably require the doubling of the present capacity of our works at an early day.

The Rollstone Machine Company (Wood Working, Machinery), Fitchburgh, Mass., write us:

We have had a very fair business during '86; although we have been obliged to build machinery on a very small margin. We have, at the present time, orders ahead which necessitates our running extra time. We find the calls for machinery good, and every indication is for general improvement.

Materials have advanced slightly. Labor remains about the same as through the year, and we see no chance for an advance until prices advance, as it is impossible at present prices to build machinery at a profit and increase the price of labor.

We have added the past year several improved machines for the production of goods in our line, and have quite spirited calls for them.

I. W. Colburn & Co. (Dynamo Electric Machines), Fitchburg, Mass., write us:

In regard to the business for the last eleven months would say that it has been more brisk than ever before with us. At present we are running fifteen hours every day to keep up. Have made several extensions to our buildings during the last year, and will be obliged to further increase them the coming year.

We have orders on hand that will take us until March to fill, working our full force all the time. Have turned away orders as we could not fill them in time.

Fay & Scott (Machine Tools and General Machinery), Dexter, Me., write us:

Our business the past year has come fully up to our expectations as to volume, having done nearly twice the business of any previous year, but the per cent. of profit has not been so satisfactory, and we do not feel like venturing an opinion on business for the coming year, though it looks favorable. We start the year with a reasonable number of orders on our books, but do not contemplate any enlargement of our plant this year.

The New Haven Manufacturing Company, (Machine Tools), New Haven, Conn., write us:

The volume of our business for 1886 has been quite large, but prices have been low, and the net profits proportionately small.

We now have a pretty large accumulation of orders, and the prospects for a good business in the coming year seem quite favorable.

We have been busy for some time developing our new friction clutch pulley, especially with reference to adapting them for driving the running gearing to our planers, and are meeting with very gratifying success.

Hill, Clarke & Company (Machinery), Boston, Mass., write us:

We would say that as far as our own business is concerned, in volume it is considerably more than in 1879, and we think will reach in volume the amount of business done by us in 1880. This year, 1886 has been the best year with us since 1882. The amount of business that we are getting this month of December surprises us, as we expected business to be quiet as it is usually with us at this season, but we think this will prove the best month this year.

We are not only entering a great many orders, but have a great deal of business in sight.

We think the prospect for business in machine tools for the coming year is as good as it was in 1880, and if business continues to improve as it has done this year, we should not be surprised to see another year like 1882 within another year.

The American Twist Drill Company (Machinists' Tools), Meredithville, N. H., write us:

We have been very busy the past year, and have orders now that will require about six months to fill. Expect to occupy another shop at Laconia, N. H., June 1, 1887, where we shall have increased facilities for manufacturing our new machinery.

The Joseph Dixon Crucible Company (Crucibles, Pencils, Graphite Paints and Lubricants), Jersey City, N. J., write us:

Business in our line during 1886 has been better than ever before in the history of this country. We are at work now on an addition to our pencil factory 70 feet long and 25 feet wide; an addition to our steam plant of one more steam boiler. We have enough orders for crucibles on hand to run our shop three months. We take special pride in noting the increase of business in the lubricating graphite line. This business is increasing by geometrical instead of arithmetical strides. More graphite was utilized for lubricating purposes in 1886 than ever before in the history of the world, and the future of this business is especially bright. We predict a better business in 1887 than for 1886, and we predict the good times will continue into 1888. Everything in the way of supplies, labor, etc., that we use is stiff in price, and increased rates are predicted.

Clayton Air Compressor Works, of Brooklyn, N. Y., write us:

Our shipments for 1886 aggregate an amount several thousand dollars in excess of 1885, and we anticipate an active trade during the ensuing year.

The principal demand for our air compressors, rock drills, etc., comes from the mining and railway constructing interests. Many valuable mines are lying idle, waiting for the necessary capital to equip them with the improved machinery which is necessary to their economical working; but judging by the increased number of inquiries for estimates received of late from the mining sections, we are of the opinion that this great industry is on the eve of a veritable boom.

Railroad building has, during the past year, been reasonably active, and our air compressors were employed in sinking the caissons for the Union Pacific Railway bridge at Omaha, Nebraska, and the Council Bluffs bridge on the Burlington and Missouri Railroad in Nebraska.

Our orders within the past few weeks include one No. 9 duplex steam actuated air compressor, 22″ diameter steam cylinders, 24″ diameter air cylinders, and 30″ stroke; one duplex air compressor, 16″ diameter steam cylinders, 18″ diameter air cylinders, and 24″ stroke; one No. 4 duplex air compressor, 14″ diameter steam cylinders, 14″ diameter air cylinders, and 15″ stroke; one belt air compressor, 10″ diameter cylinder and 13″ stroke, and a number of smaller sizes.

Our foreign shipments included one duplex air compressor, with four gun metal air cylinders of 26″ stroke, capable of compressing 500 cubic feet of gas per minute to 300 lbs. pressure.

This compressor was ordered for Australia, by the English Government, who, in selecting our compressor, recognized its superiority to those of home manufacture, although heretofore such compressors going to British colonies have been made exclusively in England.

The Skinner Engine Company (Portable and Stationary Engines), Erie, Pa., write us:

We are very glad to state that our business for the year 1886 has been most satisfactory.

Our orders have been over 50 per cent in excess of the previous year, and while we have not found it necessary to enlarge our works we have kept every portion of it busy.

Our sales have covered a wider territory than heretofore, and aggregate a larger number than for any previous year.

Our own correspondence and facts gleaned from others lead us to hope for even a better year during 1887, and the appreciation in prices of all kinds of material certainly makes it reasonable to expect better prices for our products.

Currier & Snyder (Upright Drilling Machines), Worcester, Mass., write us:

Our business from January to April this year was very good. From April to July business was rather light, and we took advantage of the times and moved our works in a more desirable location with double the floor space we ever had before. September our trade began to increase and has steadily gained ever since. We now have orders to keep us running full time for three months.

We are looking for a good trade next year with better prices. We have added a number of new tools this year. We have also made many improvements on our drills. Have recently brought out a new tool—a boring mill and upright drill combined, and have just placed one of them in the Holyoke Machine shop; also one of our 28" drills, both of which are giving good satisfaction. Prices of material and labor are about the same as at the beginning of the year.

The Springfield Glue and Emery Wheel Company (Emery Wheels, Emery Wheel Machinery and Grinders and Polishers supplies), Springfield, Mass, write us:

We have been busy the past year, employing about thirty-five men, with the exception of October, when we ran two-thirds that number.

We get our castings and patterns made outside, which gives work to ten additional men. As compared with last year, prices of labor and material remain about the same, and we shall do about one-third more business. We think but part of this improvement comes from increased confidence in business; more from our having a greater variety of machinery adapted to a larger range of work, as we now make fifty-five styles and sizes of emery wheel grinders for wet and dry grinding, and wheels for the same.

The Hoggson & Pettis Manufacturing Company (The Sweetland Chuck and Special Machinery), New Haven, Conn., write us:

While the margins on our products, owing to the sharp competition, are very small, the volume of our business has been for years steadily increasing, and the close of the year 1886 finds us well satisfied with the amount done in this year, if not with the profits obtained therefrom.

The opening of the new year for us seems to indicate a still greater increase in our business. Prices of wages and material remain about the same.

Warren T. Kellogg, Manager of the Cohoes Iron Foundry and Machine Company, (Elevators, Cotton Machinery and Special Machinery), Cohoes, N. Y., writes us:

I have to report a year of moderate activity, with some advance over 1885 in quantity, but slightly lower prices.

The year opened well and bid fair to be a busy one, but the labor troubles of January and February seemed to frighten capital and make it more conservative than even last year, with the result of confining purchases to actual needs without extension. Hence, the only machinery purchased was for replacing old and worn out tools.

This state of affairs has been ruling in Cohoes most of the time during 1886, with no prospect of an immediate settlement on a satisfactory basis. The truce that has been patched up recently appears to be a makeshift that cannot last long.

In my opinion the Cohoes labor troubles are but a type of those found throughout the United States, and will continue to disturb business until a satisfactory solution of the problem is found, and this condition of affairs makes prosperous times extremely doubtful and uncertain, while they prevail.

Nevertheless, while I take such a conservative view of the future, I am also impressed with the fact that every disturbance of social and business matters, local or otherwise is but the working out of better times for all concerned, and laborers and capitalists, alike, are learning to regard each other with more consideration, and from it there will be evolved a solution of the whole difficulty.

We look forward to next year with more confidence than we did to 1886, and think the volume and prices, especially of iron and steel products will be greater, and trust that He who guides the destinies of this nation will lead us to more satisfactory and peaceful times.

Sterling Elliott, (Drill Presses, Small Tools and Bicycles, also Stitching and Tying Machines), Newton, Mass., writes us:

My regular business has been very satisfactory during the past year. The drill press and small tools have held their own; I now have several unfilled orders for the former. Have kept an average of nine men at work on the stitching and tying machines, have also got them well introduced abroad. Am at present working eighteen men, and shall hire as many more as soon as my new shop is ready for occupancy, which it will be in two weeks. My greatest rush will be on the new tricycle, for which I am getting in the material for six hundred, nearly one-hundred and fifty of which are already sold. Shop as now completed is 45x36 feet, four stories high and has 95 windows (and a small mortgage).

My creditors are quite tranquil at present, and there is every indication that I shall live through another year.

The Knowles Steam Pump Works, 93 Liberty street, New York, write us:

We have but little to say regarding business or prospects. We have been building a little addition to our works, but as to the outlook for the coming year, we see but little change.

The Valley Machine Company (Steam and Power Pumps), Easthampton, Mass., write us:

Our steam pump business for 1886 will compare favorably with last year, which is rather better than we expected. We have not tried to make sales, hard enough to break our prices, preferring to let others do that. We prefer to keep the standard of our work up, make a fair profit, and abide results. Shall add to our line next year a duplex steam pump, in which we have "great expectations."

S. W. Goodyear (Wire Pointing and Shaping Machines), Waterbury, Conn., writes us:

To your inquiry I have to answer that, through the early part of 1886, my business was dull. My specialty in machinery seemed to be looked upon as a luxury, which the condition of business forbade indulgence in. But beginning with October there have been more inquiries, a few orders, and a more promising outlook for business the coming year. I am gratified to note by the letters of inquiry reaching me, that the AMERICAN MACHINIST is read—advertisements and all—and as the tendency of such reading is to bring readers up to adopting the best methods, hope to get my share of the benefits.

Best wishes for the continued welfare of all connected with the production of the journal indispensable to so many mechanics.

The Link Belt Machinery Company (Friction Clutches and Conveying Machinery), Chicago, write us:

The condition of our business during the past year has been very satisfactory indeed, sales increased about 33⅓ per cent. without any material reduction in prices. Prospects for 1887 seem to be as good as could be expected, in fact, we anticipate a further increase in the business during the coming year. Our shops have been enlarged about one-quarter, and many improvements made since the disastrous fire of a year ago. We have had orders sufficient to keep us fully employed during the entire year of 1886. Have purchased a number of new tools during the year and find steady employment for them. There has been no reduction in wages of our men during the past year; or, in fact, since we started in business six years ago, many of the present employes having been with us from three to five years, and as they become more familiar with our particular class of work have had their wages increased.

The Yale & Towne Manufacturing Company (Cranes, Scales and Locks), Stamford, Conn., writes us:

We are glad to be able to say that there is no doubt about the favorable condition of our business in all branches at the present time, and that the outlook for 1887 is very encouraging.

Perhaps the most noted improvement over a year ago is in the hoist and crane department, in which we now have orders which will occupy us for several months to come. Prices, although somewhat stiffer, have not shown any decided advance, which we consider an indication that the increase of business is due to a legitimate demand, and not to any unhealthy speculation.

Poole & Hunt (Founders & Machinists), Baltimore, Md., write us:

In the past year we have enlarged our premises, and put in quite a number of large and valuable tools. Our facilities are greater than ever, and we are fully employed.

We look for a good demand for machinery in our line during the coming year.

The Albany Steam Trap Company (Steam Traps, Water Filters, Pump Governors and Steam Valves), Albany, N. Y., write us:

It affords us much pleasure to comply with the request contained in your communication of the 9th instant.

Our business for the past year has been good; indeed, equal in volume and quite as satisfactory as that of the previous year. Our steam traps have continued actively in demand, and the inquiries for detailed information concerning their operation, from areas not hitherto covered, lead us to expect largely increased sales of them during the coming year.

We have finally perfected our pump governor to be employed in cases where, from a variety of reasons, a greatly diminished pressure is one of the factors in the heating problem, and now indulge the belief that since, with the steam trap and the pump governor, the whole question of the economical return under pressure to the boiler of the condense from steam coils is successfully settled, and the situation fully commanded, our business must be much enhanced.

We are also glad to discover that the demand for our particular character of steam valves, a specialty of our manufacture, but lately introduced to the public, has much increased during the past year, giving promise that when more widely known and understood they must certainly come into general use. But perhaps our most marked advance in the lines governing our industries has been the introduction, after laborious and expensive experiments, of a filter—Mr. Blessing's invention, which we think covers every demand that can be made for a device that shall successfully, and with dispatch practically adapting it to either commercial, or domestic purposes, remove from fluids the various impurities they may contain; and in this connection we further note that Mr. Blessing has invented a method where, by the employment of our Steam Trap and Filter in combination with steam boilers all sediment and scale may be absolutely prevented from depositing in the boilers; an invention, the remarkable feature of which must soon impress itself upon those engaged in the manufacturing industries of the land.

From the foregoing, you will gather, and justly, that we look forward with every encouragement, to a prosperous year in our branch of industry, and would be doubly assured of it were we satisfied that Congress, whatever else it does, would still leave the country under the blessing of a Protective Tariff.

William E. Kelly (Heaters, Damper Regulators, Mill Work and Rubber Machinery) New Brunswick, N. J., writes us:

We are pleased to say that the retrospect of the year that is past, and the outlook of the year that will soon commence, are alike favorable. We have not had occasion to reduce our force, on account of lack of work, and every machine in our shops has been constantly occupied. The demand for our rubber manufacturing machinery has been good; and we have fitted out a large number of factories with our Calendars, Grind Mills, our Patent Steam Vulcanizers, and other special machines required, and with our new and improved Hydraulic Plant, for the purpose of making rubber heels for boots and shoes; the Plant consisting of Hydraulic Heel Presses, Accumulator, and Pump. By this arrangement, the heels are formed in the press, and are thrown automatically out of same, by hydraulic pressure, with much less manual labor, and great increase of speed and amount of work done, over the old style screw presses. We believe we have had our share of the orders that have been given out in this country, for this line of work, during the past year. The demand seems to be steady, and a growing one in this direction. There has also been quite a large demand for the gearing, track iron, rollers, spikes, and the iron work for marine purchases and marine railways of various sizes, and we have filled some very satisfactory orders for this line of machinery.

There has been no material change in the price of labor in our works recently.

We are looking for an improvement in trade during the next year, and are making our preparations to meet a large increase in our orders.

J. E. Lonergan & Company, (Lubricators, Safety Valves and Machinists' Supplies), Philadelphia, Pa., write us:

Our production and volume of business done by us in 1886 has been largely in excess of any of the two years preceding it; profits have been proportionately less than in former years, owing in a measure to the fact that there are more producers in our line than there are consumers, and all anxious "to get their work in without due regard to the cash," or the consequences of unprofitable transactions. Another inroad on profits which is as it ought to be, our wage list has been advanced about 20 per cent., commencing with the first of April this year. The advance was made not uniformly, but with a strict regard for and consideration of the individual worth of each man. Some secured 10 per cent. others 30 per cent., according to their worth. This was done without any demands from our men individually or collectively, and so peace has reigned undisturbed in our works throughout the entire year. During the first three months of 1887 we expect to increase our shop room at least one-third, adding several tools, some of them special.

The Harrison Safety Boiler Works, Philadelphia, Pa., write us:

We are pleased to report that the volume of our business for 1886 will exceed by fully 20 per cent. that of last year, and from the present outlook we anticipate the increase to continue.

The cost of materials as well as prices received have varied but little from last year, although the present upward tendency in cost of raw materials will doubtless soon have its effect upon prices of manufactured product.

Our entire business being devoted to the manufacture of the Harrison Safety Boiler, the "improvements in production" have been in the detail of construction of this boiler, such as material used, manner of setting, etc., our vertical form of boilers as illustrated in your issue of November 13th, is one of the most marked improvements we have made, and the many desirable features embodied in this form of setting for plants of from 5 to 50 horse-power command the attention of steam users.

We have also arranged for the sole manufacture of the Cochrane Patent Feed Water Heater and Purifier, a simple but efficient heater of the "open" type, a number of which are now in use with highly satisfactory results.

The Pratt & Whitney Co. (Machinists' Tools, Forging and Finishing Machinery), Hartford, Conn., write us:

We are pleased to report the gratifying increase of 18 per cent. in the aggregate value of our sales in 1886 over those of the previous year and the distribution of our manufactures through the United States, and in Canada, Mexico, Central and South America, England, France, Italy, Germany, India and Australia. We are now giving employment to five hundred men fifty-nine hours per week, and think we can continue this through 1887.

We have recently entered into an agreement to manufacture and sell the Hill Automatic Grain Weighers, which we have made for a Western company for several months past. Forty of these scales have been put into successful operation during our connection with them; and it not infrequently happens that the entire cost of the scale is saved in less than a year's use. The scales are now offered at a reduction from former prices, and improvements in construction will be incorporated as they are hit upon.

P. H. & F. M. Roots (Forges and Blowers), Connersville, Ind., write us:

Our volume for 1886 was the same or slightly larger than 1885. Prospects for 1887 are very much brighter. Have been, and still are, changing our machines, which has taken up a good deal of our time. Our inquiries for this season are very much ahead of what they have been for a long while. We reduced our labor January 1, 1885, 15 per cent., and last July raised wages on an average 8 per cent. All our material is higher in price. On the whole we expect to do a very much better business next year than during 1886.

The Acme Machinery Company (Bolt, Nut and Special Machinery), Cleveland, Ohio, write us:

We have had a very prosperous year, much beyond our expectations.

Have added during the year quite a number of machine tools, and employ on the average 50 per cent. more force, and yet cannot get ahead of orders, so making stock is out of the question. We look forward to a still better business for 1887; have made a number of improvements in our machines in the detail parts thereof. Prices are a shade higher of both labor and material, and the tendency is to keep on going upward.

Wm. Barker & Co. (Brass and Iron Workers' Tools), Cincinnati, Ohio, write us:

We are hardly prepared to give you an item. We have only started our business last May, having sold out our interest in the late firm of Lodge, Barker & Co., in January. However, will say we are very busy. We are now working on a large contract for 17"x6½" bed engine lathes, which will keep us busy until next June. We have also quite an amount of work on our regular brass working machinery. As far as we are concerned, the outlook is very promising. Wages about the same as last year. We find prices lower.

E. A. Walker (Machine Tools), Philadelphia, Pa., writes us:

The year opened quite favorably, and is closing more so. There have been several dull months, but always found something to do. Have been making some changes and repairs, and have put in a few new tools. Have added one or two sizes to the list of combination planers, and find the interest in this tool on the increase. Am now fairly busy on orders with good prospects for 1887.

Car-Wheel Boring and Truing Machine.

Attention is directed to the accompanying illustrations of a Combined Car-wheel Boring and Truing machine, manufactured by M. C. Bullock Manufacturing Company, Chicago, Ill.

With the remarkable advancement of our railway system within the past few years, involving an enormous increase of rolling stock, general and abstract questions relating to economy of operation and maintenance have necessarily given much concern to interested minds. Of these questions none have demanded and received more attention, we assume, than the cause and prevention of undue wear and tear of rolling-stock and track.

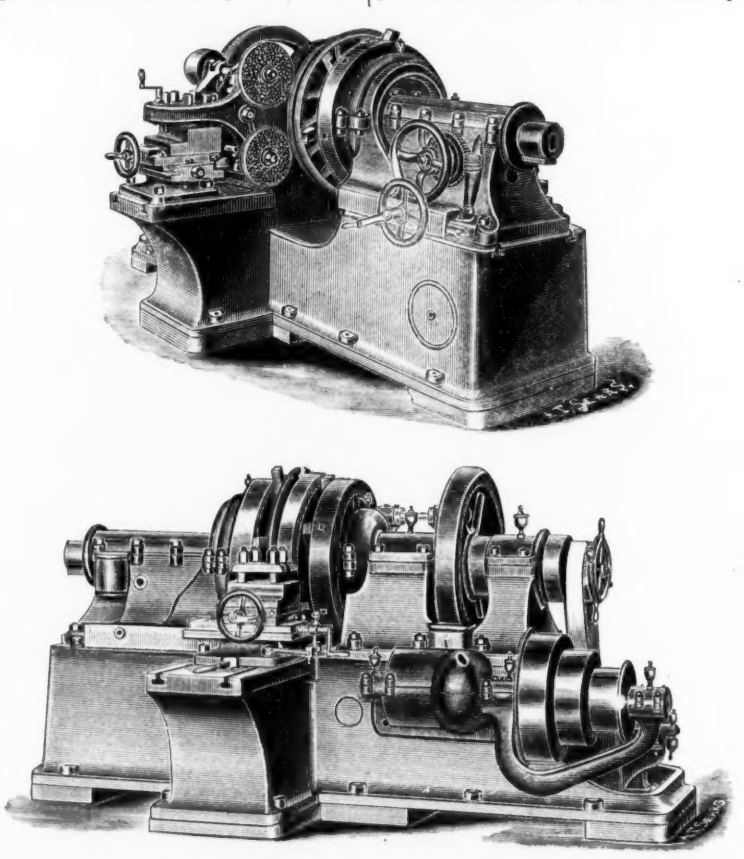
In addition to the fact that of the millions of car-wheels continuously in service, an immense percentage of the number employed are regularly condemned and withdrawn "for repairs" or the "scrap heap" before accomplishing reasonable mileage, from link-pin to brake-shoe, and from roof to road-bed the effect of their employment may be observed in the shape of wear and tear, however satisfactory the mileage of "the fittest" or limited term of service of the condemned.

The inquiry here presents, why this failure of service and this wear and tear, in view of the manufacturers' guarantee and the endorsement upon inspection "free from defects"? The answer is plain: "'Tis the little rift within the lute, which soon will make the music mute!"

The manufacturer furnishes his wheels in as perfect shape as it is possible to produce them, but a cast wheel cannot be turned out of the mould in the form of a perfect disk, it matters not how much care may be exercised in its manufacture, nor is its perimeter ever free from irregularities, oftentimes of a pronounced character, the result of unequal shrinkage in congealing. Steel-tired wheels are generally turned out in as perfect cylindrical form as it is possible to make them through the employment of the most approved machinery; but something more is required. Perfect concentricity with the center of rotation, exact correspondence of circumferential dimensions when paired, and absolute freedom from peripheral irregularities, are conditions essential to effective service of car-wheels of any construction. If not absolutely concentric their action when in revolution is that of a cam, having to lift and drop tons of weight at each revolution, the resultant damage to journal-bearings, journals, car and track, often being perceptible to a marked degree within a very short period. When the brake-shoe is applied they are likely to be caught and locked thereby and caused to slide upon the rail, a flat spot being cut upon their treads which in many instances nicks the rail at every subsequent revolution after the manner of a cold-chisel, preparing the same through the action of "Jack Frost" for a possible and not uncommon finality—a broken rail and a wrecked train. When the wheels upon an axle are not of the same circumferential dimensions, though absolutely concentric with their axis, the inclination of the larger of the pair is to run ahead of the other, throwing one or both flanges hard against the rail and causing such rapid wear and tear as to soon render one or both wheels unfit for safe employment. In addition to this flange wear, it is not only possible that the great strain brought to bear against the side of the rail may change the track-lateral to a dangerous extent, but a constant torsional strain is exerted upon the axle which is likely to produce crystallization and eventual breakage of the same, and in all probability a disastrous "smash up."

It is obvious that the proverbial "ounce of prevention" is here more than "worth a pound of cure." For doing the service expected of them, wheels should be put in proper shape before being started upon that service. They should be trued concentrically with their bore and perfectly mated before being pressed upon their axle—not afterward.

The machine which we illustrate is designed to bore and true car-wheels of any construction at one operation. The mating or pairing being done independently of and subsequent to this work, and before being pressed upon their axle, the integrity of the tread surface of every wheel is preserved, in contradistinction to being sacrificed as is unavoidably the case when the work of truing and reducing to corresponding dimensions is done after being fixed to their axle. It is constructed with a view to being able to do work of the lightest or heaviest character; it is well proportioned, and, as is apparent, subserves the purposes of a boring-mill, a chilled car-wheel grinding machine and a tire-lathe. The bed-plate is 10′ long, 3′ wide and 2′ high, with a slide-rest standard projecting from each side; the transverse measurement over all at this point being 7′. The head-stock, which is provided with two large bearings for carrying the main chuck spindle, is 3′ 6″ long, 2′ 6″ wide and 1′ 4″ from its base to center line. The main or driving chuck is provided with universal and independently-acting jaws. A corresponding chuck having three universally-acting flange supporting jaws provided in their projecting or depending ends with laterally movable adjusting-dogs, is rotatably sustained by a longitudinally adjustable carriage of admirable proportions, working upon the bore-head base which is 3′ 6″ wide, firmly secured to the bed-plate. The boring-bar bearing is 3′ 6″ long, and is extraordinarily heavy. The



CAR-WHEEL BORING AND TRUING MACHINE.

bar is operated from its upper side by a positive (change) feed, actuated by a gear fixed to the main spindle, compound slide-rests on either side of the machine carry abrading wheels or turning tools as may be necessary for the particular character of the work to be done, being operated automatically through suitable mechanism actuated by the main spindle, or by hand, as may be desired. The main spindle, which is hollow, is provided with an internal longitudinally-movable steel centering bar, intended for rapidly centering or adjusting for truing wheels having their axle seats already bored.

The operation may be briefly described as follows: The tailstock chuck being withdrawn, a car wheel is carried in a vertical position to the front of the main or driving-chuck. The tail-stock chuck is then brought up against the web on the flange side of the wheel, carrying the same over and firmly against the universal and independent jaws of the main chuck, being thus primarily fixed in position for adjustment. Such of the independently-acting dogs of the tail-stock chuck-jaws as may be needed to bring about a correct vertical adjustment of the wheel are brought up against the web, after which the independent jaws of the main chuck are caused to engage the other side by the under surface of the rim, locating the wheel concentrically with its mean diameter. Such of the universal jaws of the main chuck as will engage therewith are next set rigorously against the under side of the rim, and the machine is put in motion. As the chuck carrying the wheels are rotated, the bearing bar feed is put in action and the bar is carried forward through its work of boring the axle seat. One of the slide rests carrying abrading wheels or a turning tool is put automatically at work across the tread, while the other slide rest carrying abrading wheels or a turning tool is manipulated preferably by hand upon the tread or flange. It will of course be understood that abrading wheels are solely relied upon for truing chilled iron wheels, but in tuning steel tired wheels (for which the turning tool is invariably used) abrading wheels are advantageously employed for cutting away extraordinarily hard spots upon the tread surface or for finishing the surface roughly operated upon by the turning tool. The slide rests having all the necessary adjustments, the abrading wheels or turning tool on one side of the machine may be caused to operate upon the head of the wheel, while the abrading wheels or turning tool on the other side may be operated upon its tread or flange. A steel or steel-tired wheel pressed from its axle for repairs is first located by its axle seat upon the centering-bar carried by the main spindle, after which it is grasped and held in position by the jaws of the chucks and operated upon as above described; the boring bar feed, during such work, being thrown out of engagement and the bar of course not being employed unless it should be desirable or necessary to re-bore the axle seat.

It is claimed that the machine in a day of ten hours' work will bore and true 30 chilled-iron wheels 33″ diameter if not more than $\frac{1}{8}$″ circumferentially defective; that it will bore and true 15 chilled iron wheels, 42″ diameter if not more than $\frac{3}{16}$″ circumferentially defective; that it will bore and true the tread and flange of 8 new steel or steel-tired wheels, 33″ diameter if not more than $\frac{3}{8}$″ out of round; that it will bore and true the tread and flange of 6 new steel or steel tired wheels, 42″ diameter if not more than $\frac{3}{8}$″ defective; that it will true the tread and flange of 8 worn steel or steel-tired wheels 33″ diameter withdrawn from service, if not more than $\frac{1}{2}$″ out of round; that it will true the tread and flange of 6 steel or steel-tired wheels, 42″ diameter withdrawn from service, if not more than $\frac{1}{2}$″ out of round.

The Mechanics Institute of Minneapolis has established a free school for mechanical drawing which is under the charge of C. L. Redfield, one of the correspondents of the AMERICAN MACHINIST. Mr. Redfield has had a large experience both as draftsman and consulting engineer. The school holds sessions every Tuesday and Friday evening. It promises to be quite successful.

Suggestions in Machine Design.

BY A. J. SHAW.

II.

One of the first requisites to skillful and rapid designing is a clear and complete understanding of what the proposed machine is to do, as every condition not known at the outset will, probably, when known, require more or less modification of the design, in order to meet it.

It often happens that a knowledge of the special conditions involved in new work can be had only at the expense of extensive and costly experiments; but it is far better economy to make them than to go ahead on assumptions.

In heavy and costly machinery it is usually unsafe to insert any important detail involving new and untried principles, no matter how promising its appearance, without first testing its efficiency and their correctness, if it is possible to do so independent of the rest of the machine.

The neglect of this precaution has led to many disastrous and expensive failures.

It sometimes happens that the designer is not fully informed by his superiors with all the conditions involved—conditions of which he can have no knowledge, except through them. If this is done as a policy, nothing can be more short-sighted or unsafe; the one condition not known may be that on which depends the success or failure of the whole construction.

He who designs without apprehending clearly the conditions under which the machine in hand is to operate, is like one who journeys in the dark, without knowledge of his destination—he may get there, but how and when?

In the hands of a good designer, conditions are the cause; the design, the effect.

A designer's ability is usually in direct ratio to his power of grasping conditions.

The best designing is centrifugal instead of centripetal; that is, the conception in the mind of the designer is of the machine as an entirety, on which depends the details, rather than of the individual details, as parts of which the machine is to be made up.

Do not add parts for each added function, without first ascertaining whether the requirement may not be met by modification of or substitution for, existing parts.

A design should grow, not by accretion but by extension.

No amount of good construction can compensate for a radical defect in principle, while correctness in principle may make a success of a poor construction.

But while a badly-constructed and ill-considered machine may do its work with a fair degree of satisfaction to the user; or while a patched up model may, in many cases, serve to demonstrate the correctness of the principles which it was designed to illustrate; it is none the less true that many meritorious inventions have been condemned for want of proper mechanical arrangement and construction

The laws of nature are—and he who constructs without considering them will learn some of them sooner or later—

While we consult the "Authorities" for a knowledge of the laws and principles in accordance with which we should construct, we should remember that they have no monopoly of "principles"—many exist of which they have never dreamed.

Sometimes the most successful thing is that which they condemn.

Do not be too subservient to precedent.

If you are certain that the precedent is not a correct one disregard it.

Precedent is a mortal foe to improvement.

There are designers who make many, even important, parts of their work in a haphazard sort of a way, using the first thing that

occurs to them, if it will only "do," without any very clear idea as to whether it is the fittest thing for the place.

This kind of work is a success when it happens to be, at other times a failure.

Neither omit from, nor put into a machine, anything without good reasons for doing so. Designing by guess is like buying a lottery ticket — there are more blanks than prizes.

Study each detail carefully, both by itself and in its relation to the rest of the machine.

There are many machines, any detail of which considered a part from the rest, is admirable, but, when assembled the impression conveyed is that they are parts of different machines.

On a certain machine tool, f om a shop of great reputation, were several gnurled nuts, on which were shown two entirely distinct styles of gnurling.

Either pattern was well enough, but they certainly should not have been displayed on the same machine.

In case of doubt as to the strength of any part, make it stronger.

If a machine is too strong the user finds no fault, but if it breaks down, the remarks made will not all be complimentary to the maker.

It sometimes happens, however, that we feel uncertain as to the strength of a piece because we have been accustomed to see it made stronger than may have been necessary.

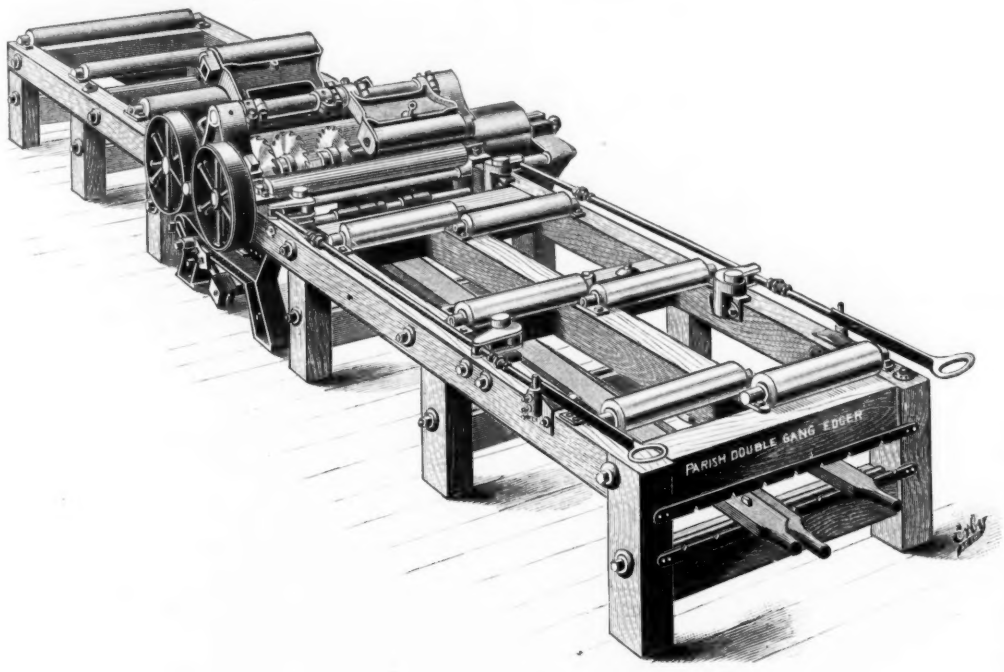
It has sometimes occurred that parts of structures have broken down because they were too rigid and unyielding.

In some classes of work too great rigidity is a source of weakness; a certain amount of flexibility being essential to durability, if not in itself a source of strength.

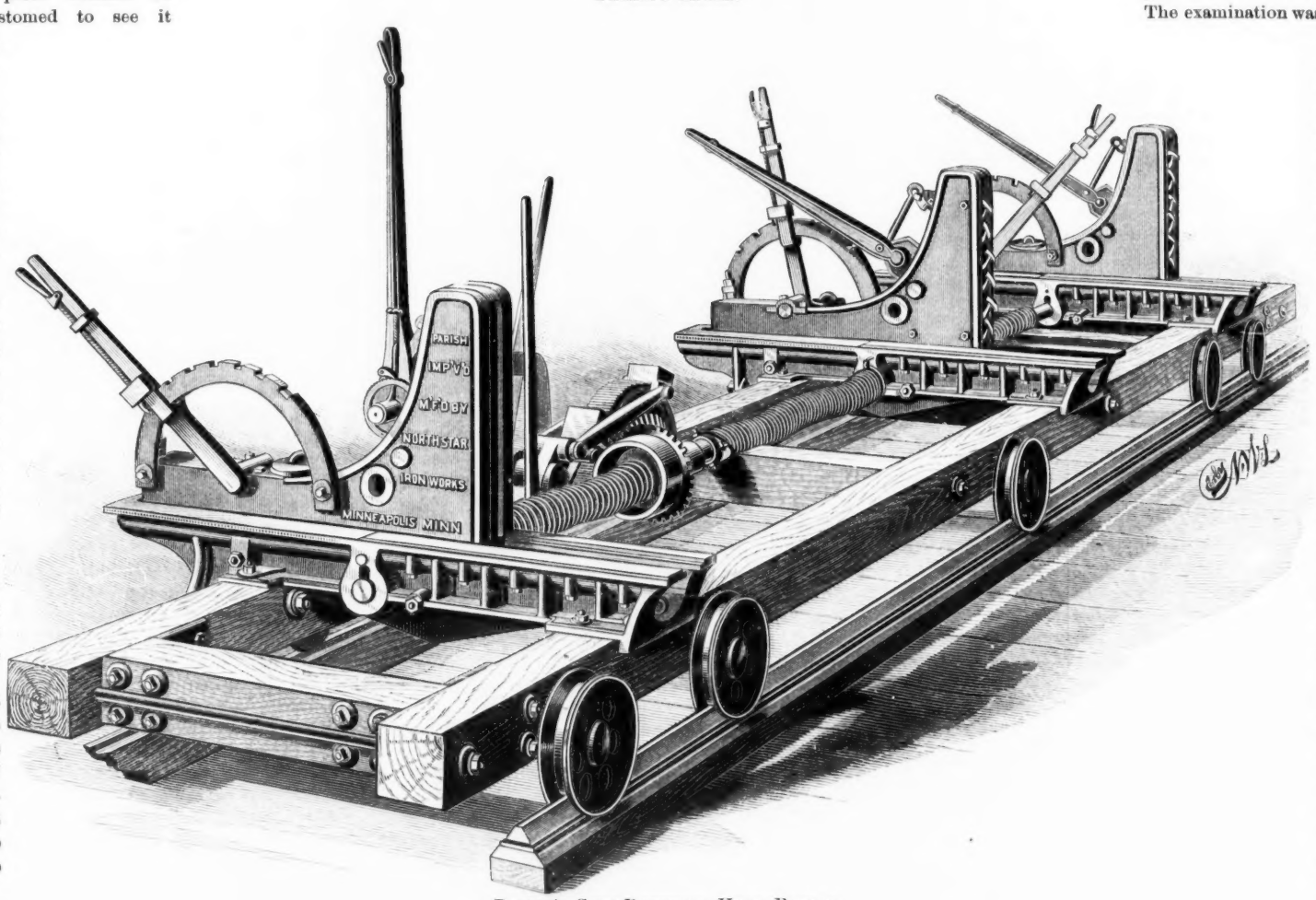
Most breakdowns are failures in detail; few machines can emulate the "one hoss shay."

The weakest detail is the one which determines the strength of the whole construction; but the weakest piece is not always the first to break.

An undue load thrown on a detail, itself of ample strength to do its legitimate work, may cause, by the springing or deflection of a weaker or less rigid piece, its destruction. The part of a machine that breaks is not always the one to be strengthened.



PARISH'S EDGER.



PARISH'S SELF-RECEDING HEAD BLOCKS.

The Parish Edger, and the Parish Self-Receding Head Blocks.

The double gang edger shown herewith has five-inch turned wrought iron idle rolls in front and behind, and heavy press rolls in front and rear. The positive feed rolls are so constructed as not to mar the lumber.

The saws are moved by levers as shown in the engraving, or, if preferred, by a wheel device. Guides take hold of saws below the throat of teeth. By an improved arrangement the saws can be quickly removed or replaced on the arbor without using removable arbor box and allowing the arbor to overhang. The arbor is 3½ inch steel, the pulley being solid-ended to prevent the accumulation of dust to destroy balance.

The head blocks have carriage made of 7½ inch by 8 inch Norway pine, strengthened with heavy iron angle pieces. The head block bases are faced on each upper side with ⅜ inch by 3 inch steel, held in place by ⅝ inch countersink bolts and nuts. These steels can be readily turned end for end, or replaced if required.

The racks and pinions are 4 inches wide, cut on special machines. The racks are of steel, and the pinions of forged iron.

The head block runs are hung in wide slides having oil reservoirs on each side; the knees are faced in front with steel. Any kind of dogs for boards or round logs can be attached. There is a safety appliance, making it impossible to set dogs or knees too close to saws, or permit them to recede too far. A ratchet wheel with 4 inch face is used; this wheel never comes in contact with the log, and moves only in one direction, viz., forward while setting.

The set lever works both ways, the dogs never being removed or tripped from the face of ratchet wheel. The receding and brake lever is one, and this with the set lever and dog lever on forward knee are the only levers the operator is required to handle. A brass scale is provided, and everything made interchangeable, and to stand hard usage. Each knee has its own independent movement for tapering.

The manufacturers of the above are the North Star Iron Works, Minneapolis, Minn.

Engineer Mary S. Brennan.

(From the Cincinnati *Commercial-Gazette.*)

The Board of Inspectors of Stationary Engineers have granted to Miss Mary S. Brennan the first license to run an engine ever issued to a lady in the United States, if not in the world. Miss Brennan is a Cincinnati lady, and is the matron of the Mt. Auburn Young Lady's Institute. She is a refined and intelligent young lady, a college graduate, and from her neat appearance and cultured conversation she is the last person in the world that would be taken for a practical engineer. In speaking of the license she said:

"Physics and mechanics always were a favorite study of mine. I tried to master the study of mechanics, and as my love for the science grew, I began to long for practice in preference to theory. My desire to gain this knowledge led me to frequent the boiler-room. We formerly had so much trouble with the heating of the building that I determined to remedy the bother, and last summer I went to the boiler-room, and during my inspection I found a crack in the plate and asked that the boiler be repaired. The boiler was formerly under the building, but I did not like the location, so I drew plans and diagram and had it taken out from under the building and placed under one of the porches. I was compelled to give my personal attention to the heating of the house; and so I concluded to have the machinery fixed to suit me. When the repairs were finished I resolved to take entire charge of the boiler, and went before the Board of Inspectors and was examined and obtained a license. I have a fireman who does the firing for me. If he is away I start the fire and raise the steam myself. We only use ten pounds of steam in heating the building, and sometimes it runs down to two pounds. I have a steam gauge on the second floor, and can tell at any time just how much steam we are carrying. I am delighted with the duties, and believe I would like to devote my entire time to the boiler and machinery." Mr. E. D. Bateman, the inspector who examined Miss Brennan, said: "I was amused when she applied for a license, as I had never heard of a lady having been granted a license to run an engine. The examination was a very rigid one. I asked her the size of the boiler, and she answered at once. I asked her the area of the steam pipe, and she answered in a minute. She quickly told me how to set the safety valve to blow off at any desired pressure; in fact, she answered the questions about as fast as I could ask them, and I couldn't help but give her a license. I know of no law debarring her on account of sex, and I believe she could have compelled me to give her a license under the law if I had refused."

The Swansea, Wales, correspondent of the *American Artisan* says:

"Just what I have intimated in previous letters is taking place. Workers in tinplate mills are being reduced 10 per cent. in wages. Some one induced his men to accept a 10 per cent. reduction, and was thus able to under-sell his neighbor. The neighbor found out the reason of the cut, and reduced his men 10 per cent. also, and so it is going on. It is the most utterly useless policy that could be pursued, for, while it distresses the workmen, it affords no relief whatever to manufacturers, for a corresponding reduction in prices of tinplates is inevitable."

E. D. Davis, Minneapolis, Minn., gives in *Wood and Iron* the number of cubic feet in a ton of coke, coal and charcoal: Coke, 60 to 80; coal, 40 to 50; charcoal, 100 to 110.

Eminent French naval officers are of the opinion that light, swift cruisers are to take the place of large unwieldy ironclads.

LETTERS FROM PRACTICAL MEN.

Backing Off Taps.

Editor American Machinist:

In issue Nov. 6, W. A. G. (387) asks how to back off taps in a lathe. This is accomplished through a cam, which for convenience may be at back of bed driven by a splined shaft, supported in bearings, one at head end of bed and one on carriage. The cam may have one high point and be driven by gears the same as screw or feed rod, and to make as many revolutions to one of spindle as there are flutes in the tap. Thus, for a tap of four flutes the cam would make four revolutions to one of spindle. Make a connection piece one end of which is attached securely to cross slides on carriage, the other end arranged to be actuated by cam. After the tap has been threaded and fluted, place it again in the lathe on center as for threading, connect the cam shaft by gears of proper ratio to spindle, attach connecting piece before mentioned, disconnect the cross-feed screw and arrange by weight or spring or other suitable device to draw the slides towards the front of lathe. The cam forces the tool into the metal, and the inclination of the cam determines the amount of backing. The carriage should have compound rest, the secondary slides being used to give the proper depth of cut. This is not new.

A. S. ALDEN.

Making Loam Pipes in Casings.

Editor American Machinist:

Some time since I had to make some special pipe. They were straight on the inside, but the outside looked more like a big jar. They were 2 inches thick from the socket to within 8 inches of the top; from there they were 1 inch thick, so as to be of the same diameter as common pipe. There were 20 pipes 36 inches diameter, and 40 which were 30 inches. The order was like most foundry orders—to be filled yesterday.

There were some casings in the shop, used to ram up pipe in, but these pipes could not be rammed up in them because the casings were oblong, and on two sides there would not be more than $\frac{1}{4}$ inch space for the rammer. The casings were made, or supposed to be, in half-segment circles 6 feet long. The pipe wanted was 12 feet long, so 4 of these segments would make the length.

I made a furnace on the bottom where the pipe was to be loamed up. It was a cheap affair, but answered the purpose very well indeed. I made two plates 3 by 4 feet, with two square holes in each to hold the bearing bars. The bars were square, with a shoulder about 2 inches from each end to hold the plates against falling in; the bank held them against falling out. A plate for the bottom, and a few grate bars made everything complete. The casing being in six feet sections, a man standing inside could loam up one very comfortably.

Get the two casings on the floor, one over the furnace, and the other alongside it. Get inside and put on loam, about $\frac{3}{4}$ inch thick. If, after you have the loam on, and are congratulating yourself on the nice job you have, it should all slide off, don't get disgusted; that is exactly what happened me, and I can sympathize with anyone in the same fix.

While you are in the casing, let one of the boys get a lot of sticks and shavings ready; then, as soon as you are ready, hoist one section on the other, keeping the joints clean, so as not to throw them out of line. Get a fire started as quickly as possible, or you may have a land-slide Have a brisk fire for ten or fifteen minutes; then slack it down a little by putting on a plate, with a brick or two under it. The steam will soon begin to come out of the holes; when it ceases, you will know the loam is dry.

Now for the centers. There are plates for the bottom of the casings that the pipes are cast on. These are turned up in the lathe, so you can get a cross with three arms for the bottom, and the same for the top, with a hole in the center for the spindle.

As soon as the loam is dry rake the fire out and let down the bottom center. The most common way of setting sweeps is to put in the spindle and then put the board on, but this will not work well in this case. The best way is to fit the sweep to the spindle, and lower all together, then put the top cross on and center it.

It is a long way to reach from the bottom of the mould to the top, so I made a scaffold, using two pieces of 2″x4″ wood and bored a hole in it 2 inches diameter for the spindle, and two holes to bolt the pieces together. To each of these pieces I nailed a half-round board fitted to the spindle; these bolted together will never slip.

Get into the casing as soon as possible after getting the fire out, for if it gets cold the loam will be liable to slip off again,

One man and two boys made one 36-inch pipe in $1\frac{1}{2}$ days, and one 30 inch pipe in one day.

I had the top end of the spindle squared, so that a wrench 5 feet long would fit it. This was very handy in turning the spindle; one of the boys could turn it.

Some moulders may wonder why I had three instead of four arms to the cross. When a man gets into a casing directly after the fire is withdrawn he may want to get out very quickly. Three arms offer less obstruction to his exit than four.

The casings are made with a rammer on the side from the top to the bottom. The rammer is rammed up with a draw gate at the bottom.

Use this rammer to fill up the socket, or to a foot above the bottom. The other rammer is made by a core that fits around the top of the pipe and outside the center core, with 12 or 14 grooves cut in stem for rammers, so when you have about 12 inches of iron in the bottom rammer you can get it over into the other as quickly as possible.

The mould can be dried either where it stands, or put in the oven.

THOMAS WATHEY.

How to Make Good Blue Prints.

Editor American Machinist:

In reply to the questions concerning blue prints in the issue of December 18, I have obtained very good prints in the following way: Solutions, one part red prussiate potash, in six parts water; one part citrate of iron and ammonia, in four parts water. The proportions are by weight. Mix equal parts of these solutions before applying; keep the mixture away from sunlight; apply with soft brush, and use as soon as dry. The sensitized paper will be nearly useless if kept for twenty four hours even in the dark. When freshly prepared, it is yellow, with greenish tinge, but gradually becomes gray, and is then of no use.

Best paper to print from is parchment tracing paper. Drawings can be made in pencil on white paper; the parchment tracing paper wet and stretched over the pencil drawing, and the tracing preserved as original. This paper will stand one erasure of ink, but not more.

To get a clear white line, the ink used must be very opaque. Time of exposure, from $4\frac{1}{2}$ to 6 minutes to clear sunlight; more if somewhat overcast, and no length of time will give a good print on a very cloudy day. Begin with $4\frac{1}{2}$ minutes' exposure. If print is too light a color, leave exposed longer next time; if lines are not clear white, the ink used is not opaque enough, or the papers have not been pressed together sufficiently—*i. e.*, you need more blanket backing. A little experience will show the proper color of print when it has been exposed long enough.

Wash prints immediately on removal from printing frame, and wash thoroughly, or else the white lines will not remain white. A porcelain-lined sink is best for washing, but the important thing is to use plenty of water. Any white paper of sufficient weight to stand the washing is good. For small sheets paper such as that which this is printed on will do well.

A lighter blue will be produced by anything which partially intercepts the light—a double thickness of tracing paper or a flat tint, for instance.

S. X.

Limiting Numbers of Teeth.

Editor American Machinist:

Mr. Columbus criticises my reply to your correspondent, J. F. G. As he states, my statement that the arc of recess could not be less than half the pitch, was a mistake, and I saw it myself, as soon as it appeared in print. As everybody knows, the arc of recess can be zero, and is zero if the addendum of the driving gear is zero. My only excuse is haste.

"One good turn deserves another," and I will correct Mr. Columbus while the matter is on deck.

If a pinion will drive a wheel, the wheel will not always drive the pinion. See "the book." If the arc of recess is equal to the pitch, 11 teeth will drive 22, but nothing less than 515 will drive 11, the recess being the same. The limits are always higher, when the larger wheel drives.

The tables of limiting numbers are found on geometrical considerations, and friction has nothing to do with them. Friction has its influence, but it is not considered in the tables. Don't go to "the book" for information on friction.

The difference in friction on the two sides of the line of centers is not small. It is considerable, and is and must be considered in ordinary practice, to secure good results. But then, it is too much the custom to wink at friction, and let it take care of itself.

The work done by friction is not "directly proportional to the distance of the point of contact from the pitch point." The work done to any given point is, for the involute, directly proportional to the square of the distance, as measured on the arc of action. For the epicycloid it increases much more rapidly than for the involute.

The work done is not "inversely as the cosine of the obliquity."

For the involute it has nothing whatever to do with the obliquity, and for other forms the obliquity has varying effects. On work, or friction in general, see Reuleaux. "The book" does not reach that level of the science of the teeth of gears.

The distance of the point of contact does not "depend on the arcs of approach and recess." The maximum distance does, but not otherwise.

The cosine of the obliquity does not "depend on the arcs of approach and recess." For the involute, the obliquity is constant and the arcs named may vary. For the epicycloid, the distance of the point of contact has its influence on the obliquity, but the arcs of approach and recess can affect only the maximum values.

GEO. B. GRANT.

BOSTON, Mass.

The Hydraulic Ram—A Wooden Elbow.

Editor American Machinist:

I received a forcible illustration last summer of the principle upon which the hydraulic ram operates. By a blast in the quarry about seventy-five feet of 5″ suction pipe was shaken down, the break taking place at an elbow, the pipe lay at the bottom full of water with the open end about four feet above the foot-valve. Wishing to empty it as quickly as possible I thrust my hand into the valve and pushed the "clack" open. It opened easily and the water started out with a rush, but the rush shut the valve with a force that nearly left me fingerless. By substituting a stick for my hand I soon had the pipe ready to put in place again. But the elbow was a wreck, and another one was not to be had very soon, so I extemporized one from 4 inch oak plank. Two pieces 12″ square were cut off and from two sides at right angles with each other large semi-circular grooves were cut to the center, just fitting the outside of the pipe. Then with a $\frac{5}{8}$″ inch bolt in each corner the two halves of my wooden coupling were squeezed upon the pipe. A crack or seam about $\frac{1}{4}$ inch between the two blocks was calked with hemp and the pump started again. A new iron elbow is patiently waiting now for the wood one to give up its grip, but I think it will take more than the frosts of one winter to end its usefulness.

F. L. JOHNSON.

Waukesha, Wis.

Practical Drawing.

BY J. G. A. MEYER.

ELEVENTH PAPER.

Problem 8.

115. TWO SIDES OF A TRIANGLE AND THE ANGLE WHICH THEY CONTAIN BEING GIVEN TO CONSTRUCT THE TRIANGLE.

Let the lines A and B (Fig. 81) represent the given sides, and C (Fig. 82) the given angle; it is required to draw a triangle as shown in Fig. 83, in which the length of the side $D\,F$ will be equal to that of the line A, and the length of the side $E\,F$ equal to that of the line B; and the angle F which the two lines $D\,F$ and $E\,F$ contain or in other words, the angle F formed by the two sides $D\,F$ and $E\,F$ shall be equal to the angle C.

Fig. 83. Draw a line $F\,E$ whose length is somewhat longer than the given line A; (no measurement need to be taken for this purpose, draw the line $F\,E$ long enough), at one end of this line, as F for instance, construct the angle $D\,F\,E$ equal to the given angle C; thus: from the vertex of the angle C and with any radius draw an arc intersecting the sides of the angle in the points g and h; from the point F as a center and with the same radius as before, draw an indefinite arc $k\,l$ intersecting the line $F\,E$ in the point k. From the point k as a center and with a radius equal to the distance between the points h and g, describe a small arc intersecting the arc $l\,k$ in the point i. Join the points F and i by a straight line $F\,D$, make this line of any length longer than that of B. Here then we have made the angle at F equal to the angle C, and so far our construction is the same as that in problem 3 (Art. 111). From the point F as a center and with a radius equal to the length of the line B, describe a short arc intersecting the straight line $F\,E$ in the point E; also from the point F as a center and with a radius equal to the length of the line A, describe a short arc intersecting the line $F\,D$ in the point D. Join the points D and E by a straight line; then will $D\,F\,E$ be the required triangles whose side $F\,E$ is equal to B; $F\,D$ equal to A; and the angle at F equal to the angle C.

Directions.—In the upper part of the space marked Prob. 8, draw two lines A and B of any convenient length, also the angle C of any magnitude (do not copy the angle C given in the illustration, make the angle on the sheet larger or smaller than C) assume the lines A and B, also the angle C, thus drawn to be the given lines and angle. In the lower part of the same space draw any straight line, $F\,E$ not parallel to any of the division lines, and then construct the triangle as explained in this article.

Draftsman's Method.—None. In constructing this triangle the geometrical method must be followed.

Problem 9.

116. A SIDE AND TWO ANGLES OF A TRIANGLE BEING GIVEN TO CONSTRUCT THE TRIANGLE.

There are two solutions in this problem, first:

Let the line A (Fig. 84) represent the given side; B (Fig. 85) and C (Fig. 86) represent the given angles. It is required to draw a triangle as shown in Fig. 87, in which the length of the side $D\,E$ shall be equal to that of the line A; the angle at D equal to the angle B, and the angle at E equal to the angle C.

Fig. 85. From the vertex of the angle B as a center, and with any radius, describe an arc intersecting the sides of the angle in the points m and n.

Again, Fig. 86. From the vertex of the angle C as a center and with any radius, describe an arc intersecting the sides of the angle in the points o and p.

It should be distinctly understood that the radius used for describing the arc $o\,p$ need not be the same as the radius adopted for the arc $m\,n$; in fact we would advise the student to use a greater or smaller radius for the arc $o\,p$ than that used for the arc $m\,n$; by so doing he may obtain a clearer conception of drawing angles.

Fig. 87. Draw the line $D\,E$ of any length.

From the point D as a center, and with a radius equal to the length of the line A, describe a short arc intersecting the line $D\,E$ in the point E, then will $D\,E$ be equal to the given line A. From the point D as a center, and with a radius exactly the same as that used for the arc $m\,n$, describe an arc $r\,s$ intersecting the line $D\,E$ in the point s; from the point s as a center, and with a radius equal to the distance between the points m and n, describe a short arc intersecting the arc $r\,s$ in the point r. Through the points D and r draw a straight line $D\,F$ (draw it long enough). From the point E as a center, and with a radius equal to that used for the arc $o\,p$, describe an arc $t\,u$ intersecting the line $D\,E$ in the point t; from the point t as a center, and with a radius equal to the distance between the points o and p, describe a short arc intersecting the arc $t\,u$ in the point u. Through the points E and u draw a straight line $E\,F$ intersecting the line $D\,F$ in the point F; then will $D\,F\,E$ be the triangle required, in which, by construction, the angle D is equal to the given angle B; the angle at E is equal to the given angle C, and the side $D\,E$ equal to the line A.

Directions.—In the upper part of the space marked Problem 9 draw a straight line A of any convenient length, also any two angles as B and C. This line A, and these angles B and C thus drawn are to be assumed to be the given line and angles.

In the lower part of the same space draw a straight line $D\,E$ and construct the triangle according to the instructions given in this article.

In this solution of the problem we started with the supposition that the two given angles must be adjacent to the given side; and under these conditions the construction is correct. But the statement of the problem admits of other conditions, for, we may assume, and correctly too, that the triangle to be drawn shall have only one of the given angles adjacent to the given side with the other given angle opposite to the same side. Hence we have this second solution of the same problem.

117. Here, as before, let the line A (Fig. 84) represent the given side, B (Fig. 85) and C (Fig. 86) the given angles; but now it is required to draw a triangle as shown in Fig. 88 in which the length of the side $G\,H$ shall be equal to that of the given line A, the angle at G equal to the angle B, and the angle at I (that is the angle opposite to the side $G\,H$) equal to C. Draw as before the line $G\,H$ and make its length equal to that of the line A; construct the angle at G equal to the angle B in a manner as explained in the first solution of this problem, and also explained in articles 111 and 115. Our next step will be to construct the angle at H, but since we do not know the size or magnitude of this angle, we must find its magnitude by a method or construction which we must first establish.

In geometry we find truth and principles which if carefully studied and remembered will not only aid us in the solution of future problems but will also help us at present in finding the magnitude of an angle in a triangle when we know the magnitude of the other two angles in the same triangle. In geometry it is proved that the sum of the three angles in any triangle is always equal to two right angles, and since a right angle contains 90 degrees (see article 38) we conclude that the three angles in a triangle taken together will contain 180 degrees. Therefore if we know the number of degrees contained in each one of two angles in a triangle, we obtain the number of degrees in the third angle by subtracting the sum of the degrees of the two angles from 180.

So also when we know the magnitudes of two angles in a triangle without giving the number of degrees, we can obtain the magnitude of the third angle by subtracting the sum of the magnitudes of the two angles from the sum of two right angles. Keeping this in mind we can easily perceive the correctness of the following construction by which the magnitude of an angle in a triangle can be found when the magnitudes of the other two angles in the same triangle are known. Thus, for instance, let be required to find the magnitude of the angle at H in the triangle shown in Fig. 88, when the magnitudes of the angles at I and G are known. Of course it must be remembered that the angle at I is equal to the given angle C (Fig. 86), and the angle at G equal to the angle B (Fig. 85). Draw as in Fig. 89 a straight line $L\,M$ of any length. At any point as N, located about centrally in this line, construct an angle $I\,N\,M$ equal to the given angle C. Also at the same point N construct the angle $G\,N\,I$ equal to the given angle B; then the remaining angle $G\,N\,L$ will represent the magnitude of the angle to be drawn at H in Fig. 88. In a similar manner we can always find the magnitude of an angle in any triangle when we know the magnitude of the other two angles in the same triangle. Now, knowing the magnitude of the angle at H in Fig. 88, we can proceed with the construction of the triangle shown in the same figure. From N as a center (Fig. 89) and with any radius describe an arc intersecting the side $G\,N$ in the point g, and the side $L\,N$ in the point l. Now, Fig. 88, from the point H as a center and with a radius equal to $N\,g$ draw an arc $y\,z$ intersecting the side $G\,H$ in the point y; from the point y as a center and with a radius equal to the distance between the points g and l in Fig. 89 draw a short arc, intersecting the arc $y\,z$ in the point z. Through the points H and z draw a straight line intersecting the $I\,G$ in the point I; then will the triangle $I\,G\,H$ be the required triangle.

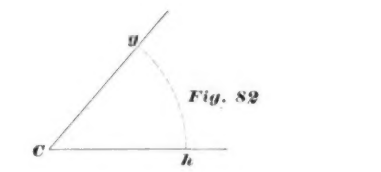


Fig. 82

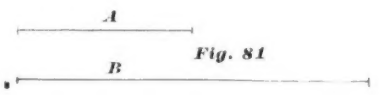


Fig. 81

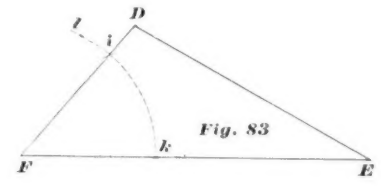


Fig. 83

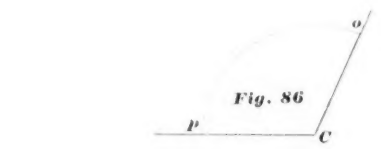


Fig. 86

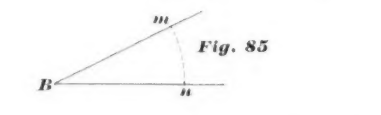


Fig. 85

Fig. 84

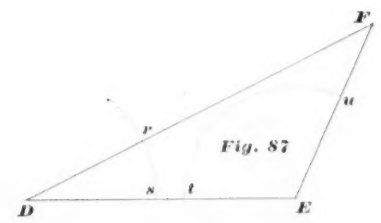


Fig. 87

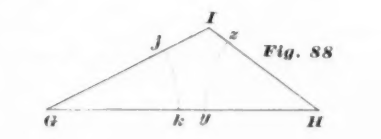


Fig. 88

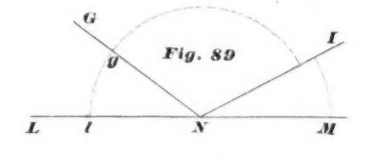


Fig. 89

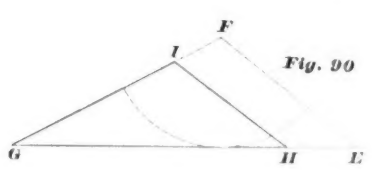


Fig. 90

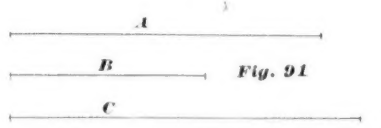


Fig. 91

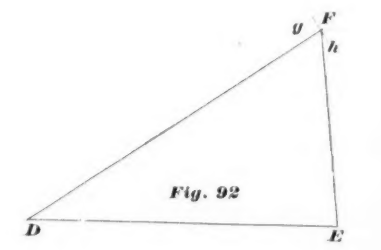


Fig. 92

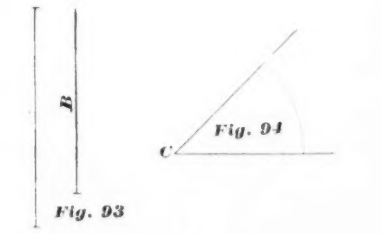


Fig. 93

Fig. 94

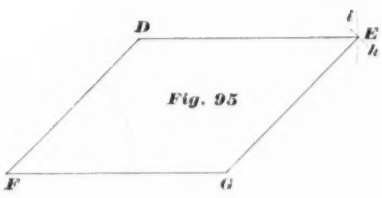


Fig. 95

Directions.—In the upper part of the space marked Problem 10 make the construction as shown in Fig. 89; and in the lower part of the same space draw the triangle as shown in Fig. 88 according to the instructions given in this article.

118. *Draftsman's Method.*—When a triangle is to be drawn, as shown in Fig. 87, the draftsman adopts the geometrical method as explained in Article 116. When a triangle is to be drawn as shown in Fig. 88, then some draftsmen will employ the following method:

Fig. 90. Draw the straight line $G\,E$ of any length. At the point G construct an angle equal to the given angle B (Fig. 85), and draw the indefinite line $G\,F$. At any point as F in this line construct an angle equal to the given angle C, draw the line $F\,E$. On the line $G\,E$ lay off a distance $G\,H$ equal to the given line A (Fig. 84). Through the point H draw a straight line parallel to $F\,E$, then $G\,I\,H$ will be the required triangle. Notice the difference between the triangles in Fig. 87 and Fig. 88, both are drawn correctly, but in Fig. 87 the given angles are adjacent to the given line, and in Fig. 88 only one of the given angles is adjacent to the given side, and the other angle opposite the given side.

Problem 10.

119. THE THREE SIDES OF A TRIANGLE BEING GIVEN TO CONSTRUCT THE TRIANGLE.

Let A, B, and C, Fig. 91, be the given sides of the triangle, it is required to draw a triangle whose sides shall be equal to the given sides.

Fig. 92. Draw a straight line $D\,E$; from the end D as a center, and with a radius equal to the length of the line A, describe a short arc intersecting the line $D\,E$ in the point E. From the point E as a center, and with a radius equal to the length of the line B, describe a short arc g and from D as a center, and with a radius equal to the length of the line C, describe a short arc h, intersecting the arc g in the point F. Through the points E and F draw a straight line $E\,F$, and through the points D and F draw a straight line $D\,F$; then will $D\,F\,E$ be the required triangle.

120. If one of the given lines A, B, or C, in Fig. 91, had been greater than the sum of the lengths of the other two lines, or if one of these lines had been equal to the sum of the lengths of the other two lines the two arcs g and h, in Fig. 92, could not intersect each other, and consequently the problem would be impossible; but the solution will always be possible when each side is less than the sum of the other two.

Problem 11.

121. THE ADJACENT SIDES OF A PARALLELOGRAM AND THEIR INCLUDED ANGLE BEING GIVEN, TO CONSTRUCT THE PARALLELOGRAM.

Let A and B, Fig. 93, be the given lines, and C, Fig. 94, the given angle; it is required to draw a parallelogram as shown in Fig. 95, in which the length of the lines $F\,D$ and $G\,E$ shall be equal to that of the given line B, the lines $D\,E$ and $F\,G$ equal to the given line A, and the angle $D\,F\,G$ or $D\,E\,G$ equal to the given angle C.

Fig. 95. Draw the straight line $F\,G$, and at any point, as F, construct an angle equal to the given angle C (Fig. 94); in doing so follow the instructions given in Article 111 From the point F as a center, and with a radius equal to the length of the line B, describe a short arc intersecting the straight line $F\,D$ in the point D. From the point F as a center, and with a radius equal to the length of the given line A, describe a short arc cutting the line $F\,G$ in the point G. From the point G as a center, and with a radius equal to $F\,G$, describe a short arc h. From the point D as a center, and with a radius equal to $F\,G$, describe a short arc i, cutting the point h in the point E. Through the points D and E draw a straight line, and also through the points E and G draw the straight line $G\,E$; then will $D\,F\,G\,E$ be the required parallelogram, whose sides $D\,E$ and $F\,G$ are equal to the line A; the lines $F\,D$ and $G\,E$ equal to the line B; and the angles $D\,F\,G$ and $D\,E\,G$ each equal to the given angle C.

122. In drawing a large parallelogram on a floor, it may be inconvenient to draw the arc i; in that case, adopt the following method.

Draw the straight line $F\,G$ (Fig. 95), and at the point F construct the angle $D\,F\,G$ equal to the given angle C. On the line $D\,F$ lay off from F the length of the line B, and on $F\,G$ from F lay off the length of the line A. Through the point D draw a straight line $D\,E$ parallel to the line $F\,G$ by the method given in Article 113. On the line $D\,E$ from the point D lay off the length of the given line A; join the end E of the line $D\,E$ and the end G of the line $F\,G$ by a straight line; $D\,E\,F\,G$ will be the parallelogram required.

Directions.—In the upper part of the space, marked Problem 12, draw two lines, as A and B, of any convenient lengths, also any angle, as C. In the lower part of the same space draw any straight line, as $F\,G$, but not parallel to the divisi n lines. Then construct the parallelogram, having two of its parallel sides equal to B; the other two parallel sides equal to A; and the two angles, as $D\,F\,G$ and $D\,E\,G$, each equal to the angle C, previously drawn in this space.

Draftsman's Method.—For constructing the angle between the two given sides the draftsman adopts the geometrical method explained in Article 111. For drawing the parallel lines he uses the T and set square, as explained in Articles 79, 81, 107 and 113.

How are triangles classified? Article 47.

The triangle shown in Fig. 83, when classified with reference to its sides, to what class does it belong? Article 48.

The triangle shown in Fig. 83, when classified with reference to its angles, to what class does it belong? Article 53.

Can oblique angles be subdivided? Articles 51 and 52.

If oblique angles can be subdivided, to what class would the triangles shown in Figs. 83 and 87 belong? Articles 53 and 54.

What is a parallelogram? Article 59.

The parallelogram shown in Fig. 95, to what variety of parallelograms does it belong? Article 62.

REMARKS ON INKING.

123. Since all the spaces on the student's sheet are now filled with the constructions of problems, he should ink all the division lines, border lines, and the lines in the problems, following the instructions given in Art. 104, namely: to ink all the arcs of circles first, and the straight l nes last.

In inking, the student should always keep at hand a separate piece of drawing paper on which he can make tri l lines, and thus gauge his pen to the required width of line. At first, it should not be attempted to make the lines very fine; somewhat broad lines will have just as p easing effect as very fine lines. But whether the lines a e fine or rather broad, the student must endeavor, to the full extent of his ability, to obtain even and perfect lines, and all of the s me width. If the result is not satisf ctory, t e cause of the failur , to some extent, may be discovered by reading Art. 82.

We are well aware of the fact that, in the beginning, the student will have con iderable difficulty in handling the drawing-pen and making even and perfect ink lines; but this sho ld not be discouraging, for it should alway be remembered that, for making a good fi ished drawing, a great amount f practice will be requ red. Failure in the first attempt shou d be an incentive or stimu us to greater engy for acq iring the skill necessary for making excellent ink lines, and since practice is necessary to acquire this skill, a better opportunity for this purpose cannot offer itself to the student than the inking of these easy problems and those that follow. By so doing, with perseverance and patience, he will obtain a practice and gain an experience which, in the future, will enable him, and in fact will be a pleasure to him, to finish more difficult drawings.

When all the lines are inked, clean the sheet with rubber and lay it away for safe keeping, and after a few more sheets containing other problems have been finished, and our advice followed, the student will find an improvement which may be surprising to him.

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☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, JANUARY 1, 1887.

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The Machinery Situation.

Upon the beginning of a new volume—Volume 10—we have the pleasure of laying before our readers, elsewhere in this issue, a number of letters from prominent machinery establishments, relating how business has been during the past year, and what the prospects are for the year to come. Looking over these letters, it must be observed that the machinery business appears to be on a solid basis. All speak hopeful of the future. A few do not expect much change, but a general confidence in improved business runs throughout the whole of these letters. Prices of products are not as good as they should be, and material is a little higher than it was a few months ago. Labor troubles are touched upon in some of the letters, but generally the reference is to troubles outside of machinery works. Of course, these difficulties influence the machinery trade, as all branches of business are mutually dependent upon each other. The fact is, direct labor troubles in machinery establishments are comparatively few. Last spring there were some unwarranted local strikes for a reduction of the hours of labor. While the tendency of the labor problem is surely towards a reduction of the hours of daily toil, it is folly to attempt a radical change in spots. Competition won't allow manufacturers in one section to run eight hours only while their competitors in other localities are working ten.

Nothing in the letters we publish this week indicates any change in wages. The most desirable improvement which the immediate situation seems to call for, is an advance in the prices of machinery and tools.

Starting a Railway Club.

The movement to form a railway club in New York City, which we noticed last week is a good one, and ought to succeed. It is proposed to have rooms which shall be kept open every day as a sort of headquarters for railroad men. Some persons who have taken an interest in the formation of this club are apprehensive of unusual difficulties in establishing it upon a successful basis, because there were only about thirty at the first meeting. We consider such an attendance very fair for starting a local club. At the first meeting called to start a national society of mechanical engineers, which was held in the office of the AMERICAN MACHINIST Feb. 16, 1880, there were only about thirty present. But they boldly started the American Society of Mechanical Engineers, and the movement did not lag, nor were any of them apprehensive that it would not succeed. The society now numbers 736 members, and takes rank second to none. What the railway club needs is a few men who are ready and willing to push the organization forward, and who are in position to make their efforts felt. We well remember a quiet remark of the late A. L. Holley, than whom no one was more active in establishing the American Society of Mechanical Engineers. "Such a society," said he "needs an absolute monarchy at the start." Of course, after a society has been well organized, it should be fully democratic.

Private Control of Public Works.

The people own their own gas works and water works in Philadelphia, but there is a strong probability that the gas works will be jobbed out to private parties. The reason for this change is given as follows in a press dispatch:

The gas works have been a source of political corruption for years, in addition to the fact that money has been "wasted" extravagantly. The hundreds of employees have been used to carry their divisions at the primaries, to serve as delegates, and run conventions.

It is possible to run the gas office—should the new Mayor be upright and honest—in the interests of the city. But the doubt is such a grave one that there is a great clamor for a lease.

Those who are clamorous for lease tacitly admit that the people of that city are capable of only limited self-government. The same dispatch says: "The water supply is simply horrible." This indicates that the next move will be to get the people's water works out of their control and into the hands of private parties. But will the movement stop here? If the principle is to be maintained that where political corruption is discovered in municipal government that department must be given into private control, the street department must be jobbed out next. It has a large number of employes who are voters. Then the police and fire departments will come in for a like transfer. We have no doubt that Pinkerton would be ready to take charge of the former. The great principle is on trial and we await the decision with intense interest. Are the people of cities capable of holding on to their own property and conducting their own government?

John B. Root.

The mechanical and engineering public will hear with deep regret of the recent death, after an illness of scarcely more than one week, of John B. Root, the well-known mechanical engineer and inventor, and a member of the firm of Abendroth and Root Manufacturing Company, of New York. Mr. Root during his lifetime had taken out more than seventy patents. Amongst other things, he was the original inventor of the water tube boiler, which he lived to see come into very extended use in the form which he devised, and under the modification of other inventors. He was also the inventor of spiral-riveted pipe and the machinery for its manufacture, of which large quantities have been manufactured by the firm of which he was a member.

He was a prominent member of the American Society of Mechanical Engineers, and a residence of more than thirty years in New York and vicinity had made his name familiar to engineers there, and had also made him personally known to most of them. Mr. Root was a man of undoubted integrity, a pleasant companion, genial and kind-hearted, always ready to assist others with his advice and experience. He was fifty-seven years old at the time of his death; he leaves a wife and one daughter.

Last week we noted that John Fink, the bogus lubricating mixture man, had been arrested for swindling L. P. Whiteman, of the Warren Glass Works, Cumberland, Md. Since then we learn that the court held Fink in the sum of $1,000 bail for his appearance at the January term. It is to be hoped that full justice will be meted out to him.

English steam users have been somewhat exercised of late over the alleged extraordinary economical performance of the Merchant steam engine, in which the exhaust steam is returned to the boiler. It has been claimed that only about one-half pound of coal per horse-power per hour was required. It is to the credit, however, of English engineers that they very soon found the "African in the fence," and showed that in reality the apparent coal consumption, one-half pound, should be multiplied by eight, making four pounds. There are several patents in this country for returning the exhaust steam to the boiler, and thus effecting an enormous saving—on paper.

Literary Notes.

Morrison's Practical Engineer and Mechanics' Guide, second edition, is just issued. The author says in his preface: "Slight changes have been made in a few instances, and the page on electric lighting has been rewritten to meet the greatly reduced cost of electric lighting machinery, materials and supplies" The book is published by the author, Wm. A. Morrison, P. O. Box 373, Lowell, Mass. The price is one dollar.

The Christmas number of the *American Bookseller* for 1886 is a choice magazine of art of nearly 200 pages. The illustrations are superb. They are selected from a number of illustrated books for the holidays. Those wishing to pick out desirable holiday books should get a copy of this Christmas number. It is published by Nocola R. Monachesi, 10 Spruce street, New York.

The *Firemen's Journal*, of 16 Dey street, New York, which is about the same age as the AMERICAN MACHINIST, has enlarged its scope and changed its name to *Fire and Water*. As hydraulic matters are naturally associated with fire protection the new departure appears to be a good one. The paper is well edited and presents a good appearance. It is published weekly at $3 00 a year.

The Australasian and South American is a monthly commercial magazine of 100 pages, published at 40 West Broadway, New York, at $3.00 a year, or its equivalent in other currency.

It has lately changed ownership and management, and contains a great deal of matter valuable to those having trade with Australia, South America, Africa, India, China and Japan. Charles E. Bemington is editor.

"Views of Arbitration" is the title of a pamphlet lately received, printed in Rochester and issued from Albany, N. Y. No name of publisher appears, and whether the pamphlet is issued for free distribution or for sale we do not know.

Joseph D. Weeks, a good authority upon arbitration, is quoted as saying: "The future may be hopeful, may have in it the perfect solution of the labor problem; but we need a system that shall take labor as it is, and capital as it is, and their relations as they are; that shall prevent their differences from becoming disputes, that shall settle contests, if they arise, or at least shorten their duration and mitigate their horrors; that shall give passion time to cool and permit reason to assert its sway, and thus give time and opportunity to discuss the future organization of industrial society in which there shall be no place for strife.

"I believe that arbitration and conciliation is such a system. Not that it is the solution of the labor question—only on the road towards it."

"Papers in Penology" is the title of a pamphlet just received. It does not treat of styles of writing or pork raising, but of reform in prison management. There are eight papers on various prison topics. The report on Labor in Prisons and Reformatories, presented at the National Conference of Charities and Correction at St. Paul last July, is quite interesting. We quote:

"There is no probability that the prisoner's conditions and relations can be much changed so long as the contract system of employment prevails. Reform it ever so much there will always be a mercenary obstacle to the best utilizing of industries for reformations. The employment of prisoners in slavery for profit to the State introduces a bad element, but the effect is still more pernicious if their slavish labor is for profit to a third party, the contractor.

* * * * * * *

"It is as impossible for the State as for the individual to serve two masters. One or the other of them will be preferred; if it be the contractor, then the State suffers, if it be the State, then the contractor suffers, and the State violates honorable obligations, and will soon have no contractors. It may be safely said that so long as there is a sufficient monetary advantage to induce contractors to come in and employ convicts by the day, there is supplied sufficient evidence that the object, the protection of society by the penitentiary treatment of offenders, is hindered or neglected."

The report recommends the piece system for employing convicts. The pamphlet is published by the New York State Reformatory at Elmira.

Prof. Hitchcock has compiled a geological map of the United States for the American Institute of Mining Engineers. It was made to illustrate certain "schemes of coloration and nomenclature." The scheme of coloration is more than successful—it is startling. The western portion would make an excellent chart for a temperance lecturer to show the horrible effects of alcohol upon the lining of a drunkard's stomach. The eastern portion would make an unequalled pattern for tattooing a living curiosity for a Bowery Museum.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(1) A. P. R., Harrison, Me., asks: How are long shafts confined to the planer while being key-seated? *A.*—They may be clamped down to the central slot in the planer table, or in saddles, or held on centers. All of these plans are practical, the first being the most common.

(2) A. M. F., Cooper Tract, Pa., asks: How is water-gas made, and can it be used for firing under a boiler? *A.*—There is a little difference in different processes. In one process the coal is brought to incandescence by a strong blast, then steam is blown into the fire. For illuminating purposes carbon is then added. Water-gas can be burned under a boiler.

(3) E. R., Donahue, Cal., writes: I have an exhaustless well one mile from where I want to use the water. I can lay a level suction pipe that distance, and place the pump so that it will in no case be more than 20 feet above the water in the well. I want to use 30,000 gallons of water every twenty-four hours. Under the conditions, can I apply the pump one mile from the well and pump the quantity of water named, and if so, what size of suction pipe will be required? Any other suggestions will be thankfully received. *A.*—Suction pipes of this length are not entirely desirable. They must be laid with care, and made absolutely tight. They must also be large. Further than this, for this lift and length of pipe the pump must be a good one. With a pump that will form a vacuum of 26 inches, you can pump the quantity of water named in twenty-four hours through a 4-inch suction pipe; if you are to do the pumping in ten hours, the pipe should be 5 inches. The pipe should be laid without bends, up and down, otherwise it will trap air. We should lay the pipe descending all the way towards the well. All you can gain by placing the pump lower will be valuable. A large air chamber should be placed in the suction near the pump. As against this plan, if the pump is placed at the well, the cost of piping will be much reduced, as a 2½ or 3-inch force pipe could be used.

(4) C. B., Indianapolis, Ind., writes: We are preparing to make some changes, and amongst other things we have to reverse the motion of our engine. The eccentric is keyed fast to the shaft. One engineer tells us to knock the key out and cut a key-seat exactly opposite on the shaft, and key the eccentric there. Others tell us this would not be right. Can you enlighten us? *A.*—The plan you mention would not be right. The best plan is to go through the process of seting the valve over again? If you do not want to do this, then put the crank on the dead center, make a mark on the valve stem, and a prick punch mark in some convenient place, as on the stuffing box. Set a tram or a pair of dividers exactly to these marks. Now, without moving the crank, knock out the key and turn the eccentric around on the shaft till the dividers or tram just come to the marks. This will bring the eccentric nearly opposite where it is now, but not quite. You can then mark it and key it. If you will stop to think, you will see that, with the crank on either dead center, the valve should be in exactly the same position, no matter which way the engine is to run. All you have to do, then, is to put the eccentric in some other position than the one it now occupies, and which will not change the position of the valve with engine on dead center. See our issue of Dec. 25, 1886, page 4.

(5) F. A. H., Dalton, Ga., writes: We have two boilers, each 60 inches diameter and 15 feet long. The domes are connected by 4-inch pipe, from which a 6-inch pipe extends to engine—a distance of about 35 feet. There are no expansion joints in the pipes. The domes trouble us by leaking. We can caulk them tight, but they will leak in three days. Do you think that lack of expansion joints in pipe is the cause? *A.*—We think there is something wrong either in construction or arrangement—perhaps in both—which should be remedied at once, before something more serious than a leak results. If the connecting pipes extend upward from the domes four or five feet, and if at the engine there is opportunity to spring the pipe readily, it is not likely that there is a very serious strain on the domes from this cause. You do not give any particulars about the construction of domes. We should recommend that you have an examination made by some one competent to judge as to whether there is sufficient strength at this point. There will be corrosion from the leaks you speak of, and a gradual weakening that may be dangerous. 2. Is it injurious to a boiler to return the gases from the tubes back over the top of shell? *A.*—The practice of doing this is not generally approved, although it is practiced by some engineers. We do not approve of it. 3. How much petroleum can I safely use in a boiler of the above dimensions? *A.*—Begin with two quarts, and gradually increase up to a gallon if there is no foaming.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Metallic Pattern Letters and Figures to put on patterns for castings. Knight & Son, Seneca Falls, N.Y.

Solid Nickel-Seated "Pop" Safety Valves. Consolidated Safety Valve Co., 111 Liberty st., N. Y.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Davis Key-Seating Machines, kept in stock, by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Mechanical and Patent Office Drawings executed at reasonable rates, by A. Mugford, Hartford, Ct.

20", 25," 28" B G. and S. F. upright drills for immediate delivery. Currier & Snyder, Worcester, Mass.

Ice and Refrigerating Machines. 120 built, and all successful, by David Boyle, 521 Monroe, Chicago, Ill.

N. B. Non-breakable Drills and Taps. A. P. Brown, 108 Liberty st., N. Y.

Curtis Pressure Regulators, Curtis Return Trap. Curtis Damper Regulator. See Dec. 11, p. 12. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 92 Park row, N. Y.

Machinists' supplies, brass goods m'f'rs supplies, polishing materials, all kinds wire, metals, etc; in any quantity. Jordan & Gottfried, 208 Canal st., N.Y.

The Improved Tabor Steam Engine Indicator, made and sold by The Ashcroft Mfg. Co. 111 Liberty st., N. Y.

Handbook on the Care of Boilers. 50c. Descriptive Circular and Catalogue of Books for Mechanical Engineers free on application; special terms to Mechanics' Libraries. E. & F. N. Spon, Publishers, 35 Murray st., New York.

"Hints to Steam Users, Engineers and Firemen." A 100-page book on care of steam boilers; just issued; containing useful rules, tables, etc.; a valuable book for engineers; sent on receipt of 25 cts. in stamps. J. N. Mills Pub. Co., 30 Vesey st., N. Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price, $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2 post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

MANUFACTURES

A. B. Cummings, Jonesboro, Tenn., will erect a machine shop.

Alfred Kaufman, Rome, N. Y., will build a new furniture factory.

Alex. Osborn, of Clarksburg, W. Va., is building a new machine shop.

Robert Wallace, Grindstone City, Mich., will establish a new flouring mill.

Herman A. Westphel, Minneapolis, Minn., is erecting an $80,000 brewery.

It is stated that a foundry and machine shop will be erected at Jonesboro, Tenn.

J. Forbing & Son, Kenton, Ky., will erect a large chair factory in Lexington, Ky.

The Victor Mower Company, Valatie, N. Y., are adding a foundry to their works.

A movement is on foot at Athens, Ala., to form a company to build a cotton factory.

Frank A. Mason, Bentonsport, Iowa, will build a cotton mill and a barbed wire factory.

The Hintermister Organ Company, Buffalo, N.Y., will remove its factory to Oil City, Pa.

The Kalkaska Manufacturing Company, Kalkaska, Mich, will build a new saw mill.

The Lilley Manufacturing Company, Chester, Pa., will build an addition to its woolen mills.

Alfred Webb & Co., Chattanooga, Tenn., will build new boiler works and wire factory.

E. R. Carhuff, 100 Vesey street, Newark, N. J., will build a three-story factory, 27x48 feet.

Wm. G. Tucker, 451 East 119th street, New York, will erect a $35,000 factory on 116th street.

The Texas and Pacific Railroad has a building permit to erect a car shop at Marshall, Tex.

It is reported that C. T. Randolph, Washington, N. C., will start a carriage factory at New Berne.

The Adams & Price Locomotive and Machine Works, Nashville, Tenn., will be greatly enlarged.

The Case School of Applied Science in Cleveland, which was recently burned, will be rebuilt.

The Knights of Labor, it is hinted, propose starting co-operative flouring mills at Minneapolis and Duluth.

The Pembroke Knitting Mills Company, Battle Creek, Mich., will make extensive improvements to its mills.

C. G. Wilson and others have started a stock company at Milledgeville, Ga., to carry on foundry and machine shop.

The W. B. Barry Saw and Supply Company, Indianapolis, Ind., will establish a branch factory at Chattanooga, Tenn.

The Globe Iron Works Company, Cleveland, will at once enlarge their boiler shops to double their present capacity.

A. B. & Calvin Herring have the contract to build a shoe factory at Orangeville, Pa. The building will be 25x75, two stories high.

George H. Hammond & Co., Cadillac square, Detroit, Mich., will erect a large factory for the manufacture of oleomargarine.

It is rumored that a creosote factory, two iron foundries and other factories will be started at Lambert's Point, near Norfolk, Va.

C. G. and G. S. Yale, of Wallingford, Conn., contemplate establishing a new factory in Cromwell for the manufacture of Britannia ware.

It is rumored that the Woodstock Iron and Steel Company, Anniston, Ala., contemplate erecting an iron furnace at or near Sylacauga, Ala.

C. H. Thompson, Tyro Shops, N. C., contemplates erecting a foundry and machine shop, with a sash and blind factory attached, at Statesville, N. C.

The Pennsylvania Iron Company will build at Fiftieth street and Merion avenue, West Philadelphia, for the construction of gas machinery.

McCartney & Oller, Philadelphia, are architects for the erection of a two-story machine shop, 60x24 feet, on Beach street, between Norris and Bald.

Roberts & Co. have leased the Anniston Car Works, Anniston, Ala. They will put in new and improved machinery, and put the works in operation.

The Western File Works, Beaver Falls, have been closed for an indefinite time. Orders are said to be plenty, and the reason for the action is not divulged.

The Brockton Co-operative Boot and Shoe Company, Brockton, Mass., has been incorporated. Capital stock, $10,000. Olof Johnson and others, corporators.

The Remington Machine Company, Wilmington, Del., finding their old brass foundry too small, are building a new one with floor space of 35 by 42 feet, with eight furnaces.

J. P. Witherow, Pittsburgh, Pa., has contracted to build an iron furnace for the Lady Ensley Furnace Company, Sheffield, Ala., with a capacity of 125 to 150 tons per day.

Racine (Wis.) business men have subscribed $30,000 to the stock of a rubber clothing manufacturing concern at Grand Crossing, Ill., and have thus secured the establishment for Racine.

The Memphis and Charleston Railroad Company (office, Memphis, Tenn.,) have agreed to extend their road to Sheffield, Ala., and build their principal machine shops there.

Justin R. Wells, William V. Christie and Abraham S. Davenport have incorporated at Ashland, Ky., the Wells Engine Company—capital stock, $500,000—to buy, sell and manufacture machinery.

The Atchison, Topeka and Santa Fe Railroad Company (office, Topeka, Kan.) have contracted to build their machine shops at Cleburne, Texas, if one hundred acres of land are donated to them for the shops.

H. H. Morrison, an English wire-rope manufacturer, thinks of starting a factory at Scranton, Pa., as there are but two wire-rope manufactories in the United States—the Roebling, at Trenton, N. J., and the Hazard, at Wilkesbarre.

C. G. Wilson, T. T. Windsor, D. B. Sanford, Saml. Evans and others have incorporated at Milledgeville, Ga., the Milledgeville Iron and Machine Company, to buy, sell, manufacture and repair machinery. The authorized capital stock is $50,000.

The Sheffield Pipe and Nail Company—capital stock, $100,000—has been formed at Sheffield, Ala., to manufacture cast and wrought-iron pipe, bolts, nuts, nails, screws, etc., by Henry D. Thompkins, of Atlanta, Ga.; Moses Bros., of Montgomery, Ala., and others.—*Baltimore Manufacturers' Record.*

The Boston *Commercial Bulletin* says: "Advices from New Britain, Conn., are that manufacturing is somewhat dull. In one of the largest establishments in town they are piling up stock, and should business remain quiet the chances are they will remain closed for some time after January 1."

"Our Girls' Co-operative Clothing Manufacturing Company" is the title of another Knights of Labor co-operative firm in this city, says the *Western Manufacturer*, of Chicago. Over $1,500 worth of stock has been taken. The company will make ready-made clothing. Miss Mary McCormick is president.

F. I. Stone & Co., Chattanooga, Tenn., will erect a building 50x300 feet, to be covered with corrugated iron. They will move their fence factory in it, and add new machinery to enlarge the factory. Alf. Webb & Co. will move their boiler works there and double their capacity.—*Baltimore Manufacturers' Record.*

Dwight Slate, manufacturer of sensitive drills, milling machines and special machinery at Hartford, Conn., has recently bought out the plant of the Ballou Manufacturing Company, makers of various kinds of lathes for precise work at the same city. Mr. Slate proposes to push this line of machinery in connection with his present line.

I. W. Colburn & Co., Fitchburg, Mass., manufacturers of electric lighting machinery, send us a copy of their price-list and hand-book—"vest pocket edition." It is 2¾"x2"; and contains much useful information, but most of the print is so fine that a reader needs the instrument mentioned by Sam Weller as "a double-million magnifying glass microscope of hextra power."

A new machine to make railroad car coupling pins is in successful operation at the Pittsburgh Forge and Iron Works by which thirty-five pins can be made in a minute. One thousand pins made in the old way was considered a big day's work. A machine for making car links is soon to be put up; this is to turn out about twenty-five links to the minute. The process is precisely the same.

Citizens of Old Orchard, Me., have made an organization to offer inducements for some shoe manufacturer to locate there. They have pledged $4,000 for stock, and will erect a building, provide it with power, and donate the use of it for a term of years to any reliable shoe firm who will locate their business at Old Orchard. The town has voted to exempt any such firm from taxation for ten years.

The Straight Line Engine Company, Syracuse, N. Y., has recently received orders as follows: Two 7"x12", to Steinhart & Sons, New York, for electric lighting; two 11"x16", to Edison Electric Illuminating Company, Westchester, Pa.; one 9"x12", to Crandall Type Writer Company, Groton, N. Y.; one 9"x12", to Bellani Fratelli, Milan, Italy, for electric lights; one 9"x12", to E. M. Jones & Co., Cleveland, Ohio, for electric lights; one 9"x12", to Beech Creek Railroad, to drive machine shop.

The *Sanitary News*, in referring to the plumbing business in Milwaukee, says: "As for the co-operative shops, they continue to do business, and, in order to do so, they have cut prices considerably, doing the work in some instances for less than strict business methods would justify; this illegitimate competition, it is but natural, no one established business man can cope with, and, if the co-operatives were to depend upon the united efforts of their organization in that city, they could not hold out long. It is said that the men in the co-operative shops work for $15 a week, while the masters pay as high as $3.50 a day.

The new boiler shop which is being built by the Brooks Locomotive Works takes in a large portion of the old one. Work has gone on in the latter as usual while the new one has been in process of construction. The walls of the new shop are up, and the roof is nearly completed. The new building is 150x80 feet, with high walls and plenty of light. It is to be provided with a Yale & Towne 15-ton traveling crane—which has a spread of 78 feet—the widest, it is believed, ever built in this country. With it the heaviest boilers can be lifted or set down in any part of the shop, its travel being from one end of the shop to the other.—*Railway Review.*

E. H. Brownell & Co., Dayton, O., have now in process of construction one steamboat boiler for Alaska; two for Grand Rapids, Mich.; one rotary boiler for paper mill, 7 feet diameter, 24 feet long, for Middletown, O.; one 66x16 feet tubular, for Sandusky, O.; two locomotive style of boilers, for Bucyrus, O.; two 42x12 foot tubulars, for Chicago, Ill.; one 42x10 feet, for Findlay, O.; two 48x12 feet, for a party in Michigan, and two 60x14, for Franklin, O., and six 60x16, for Indiana. During the past few months this firm have built boilers for Texas, Nebraska, Kansas, South Carolina, Indiana, Michigan, Wisconsin, Minnesota, Kentucky, Missouri, Illinois and Tennessee, besides doing a large trade in other directions, and a local State trade of considerable magnitude.

Lloyd, Booth & Co. on the 27th inst. purchased the interest of Samuel S. Brown and Harry Brown, of Pittsburgh, in the Falcon Foundry and Machine Works, on South Phelps street, Youngstown, O., known as the Booth, Miller & Co. property. The price paid was $8,272. The purchasers already owned the entire plant with the exception of the Brown interest, which has now been secured. Extensive improvements are to be made at the plant at once, which, when completed, will make it the largest foundry and machine establishment in the place.—*American Manufacturer.*

The *Northwestern Miller*, of December 3, in discussing affairs among the mills of Minneapolis, says: "This week the power is poor, but with the assistance obtained by the use of steam the product will undoubtedly overrun 100,000 bbls. There were 18 mills running to-day, 6 of which were either partly or wholly driven by steam. Several of those depending on water entirely are very seriously handicapped, not being able to get out much over one-half of their usual output, while as many more are enabled to run very little short of full capacity. The former class have asked that an arrangement be made by which the water will be more equally divided, and a meeting is being held this afternoon to consider the matter of forming a pool to regulate operations."

Machinists' Supplies and Iron.

NEW YORK, Dec. 16, 1886.

The action of the Thomas Iron Company, in contracting for the delivery next year at prices $2 in advance of last year's prices, has had a tendency to stimulate buyers, and is believed by many to foreshadow further advances in prices further on in the year. The condition appears to be that there is but little iron in stock anywhere, and that the demand is fully up to the supply. We quote, in prices, Standard, Lehigh and North River brands, No. 1 X, $20 to $20.50; No. 2 X, $19 to $19.50; Grey Forge, $17 to $17.50.

Scotch Pig—We quote Coltness, $21.50; Glengarnock, $19.50 to $20; Gartsherrie, $19.50 to $20; Summerlee, $20.50 to $21; and Dalmellington, $19.50.

Lead—There have been but few sales. at 4.40c. for spot, and 4.35c. for future delivery. Buyers and sellers seem to be slightly apart, with the effect of contracting transactions.

✲WANTED✲

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Situation wanted by mech. draftsman in a Western city. Address Western, AM. MACHINIST.

Experienced planer and slotter hand wants a job. Address M. P., 357 Ninth avenue, N. Y.

Wanted—Situation as foreman in foundry doing engine and machinery castings; best of reference. Address J. H. T., AM. MACHINIST.

Wanted—Situation as foreman patternmaker; 20 years' experience; also a draftsman; good references. Address K. K., AM. MACHINIST.

Wanted—Situation by practical engineer; adjusts and repairs modern automatic engines; use indicator. Address D. G. J., care AM. MACHINIST.

Mech'l draftsman—12 years' experience on steam engines and special mach'y—wants situation in N.Y. or vicinity. Address "Skill," AM. MACHINIST.

Wanted—A thoroughly competent man to act as foreman in a large machine shop, near Philadelphia, running upon heavy work; good salary and steady employment. Address X, AM. MACHINIST.

Wanted—By a young man with 8 years' shop experience, and a little experience at drawing, situation as mech. draftsman. J. Auc, care J. Knoepflin, 405 W. 38th street, N. Y. City

Wanted—By a first-class machinist and engineer, position as foreman where ability will count; good draftsman; experienced at heavy stationary and marine work and handling men. Address E. F., AM. MACHINIST.

Wanted—Correspondence with a competent man, with a view to build and superintend a modern iron pipe mill. Address Mill, office AM. MACHINIST, 96 Fulton st., New York.

Wanted—Superintending engineer for a large works engaged in manufacture of general machinery in an Eastern city; must be experienced and energetic. Address confidentially, with full information, A. A. B., AM. MACHINIST, N. Y. city.

Wanted—A foreman for machine shop; one who thoroughly understands the working of stationary and portable engines; give past experience, with references, and state salary expected. Address Foreman, Box 11, AM. MACHINIST office, 96 Fulton street, New York.

Wanted—A man as foreman of a foundry on agricultural and job castings; must be perfectly competent to take full charge of same, familiar with the Colliau cupola and melting with coke; also willing and able to solicit contract work. Address, with references, stating age and salary expected. The Victor Mower Co., Valatie, N. Y.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Gerlach's Engineers' Specialties beat the world. Send for price list. Crescent Mfg. Co., Cleveland, O.

Crescent grease cup for shafting beats them all. Sample free. Crescent Mfg. Co., Cleveland, Ohio.

Light mach'y of all kinds built at short notice Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

John Lamberty, mfr. telegraph and electrical instruments, experimental machs, models; fine gear cutting a specialty. 35 S. 5th st., Br'kl'n, E.D., N.Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

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Experimental and new machinery for special purposes built by contract from specifications and inventors' designs; ample facilities. Cohoes Iron Foundry an' Machine Co., Cohoes, N. Y.

For Sale—One complete set of Pulley Patterns also Patterns for Slide Valve Engines, with adjustable cut-off and without cut-off, for sale cheap Address North Star Iron Works Co., Minneapolis, Minn.

Wanted to communicate with reputable and responsible parties in or near commercial centers, who would build a first-class water-tube boiler on royalty basis. Address L. J. G., AM. MACHINIST.

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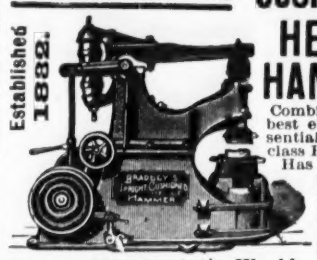

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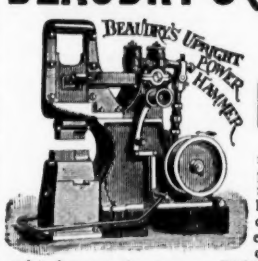

The success of our machine is the best proof of its value. Is more like a steam-hammer than any other, yet has all the economic advantages of a power hammer, and is far superior to any. Will work a larger bar of steel or iron and turn out more difficult forgings than any other hammer made. **Guaranteed as represented, or no sale.**

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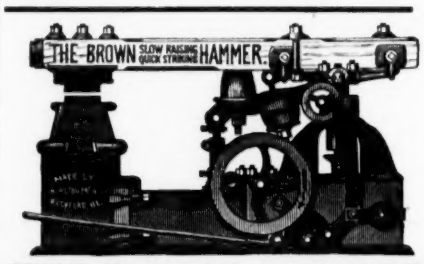

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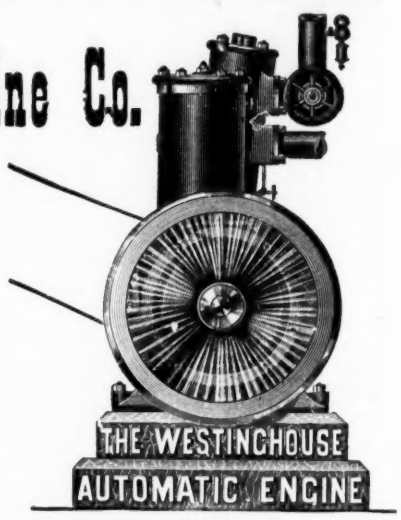

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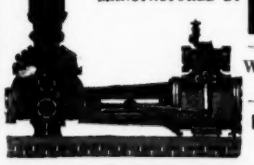

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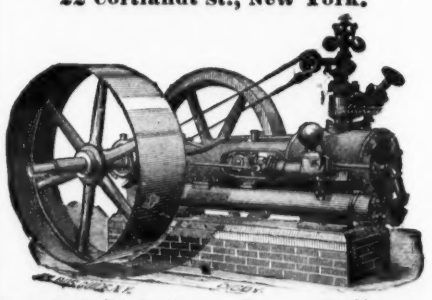

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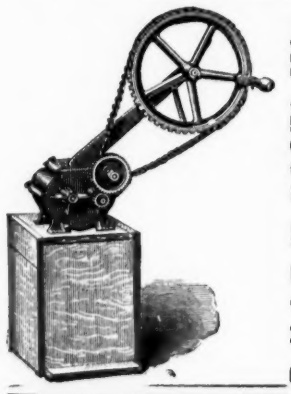

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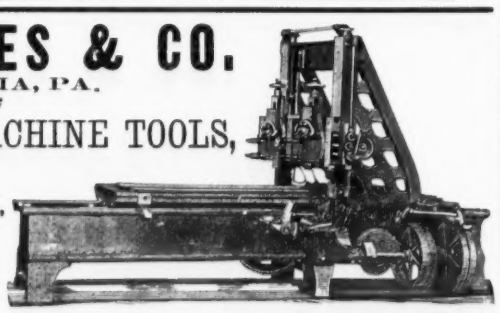

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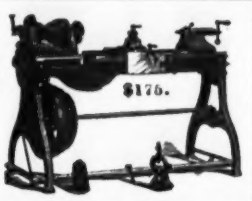

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12	2	1.20
13	2 1-4	1.35
14	2 1-2	1.45
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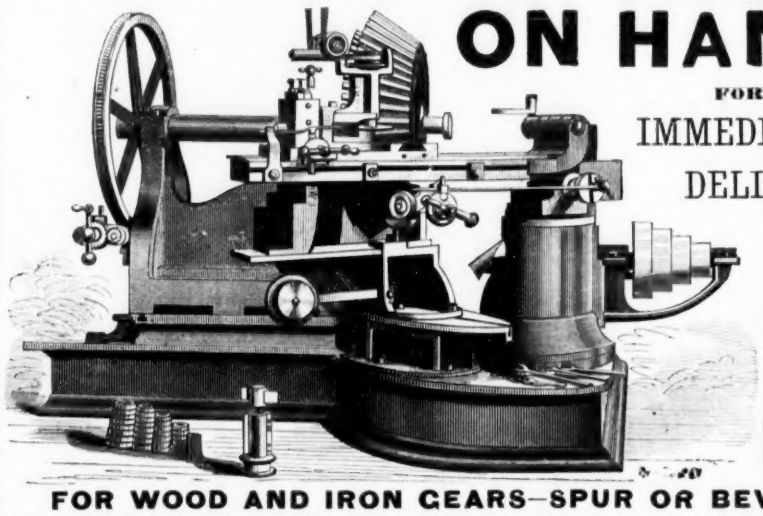

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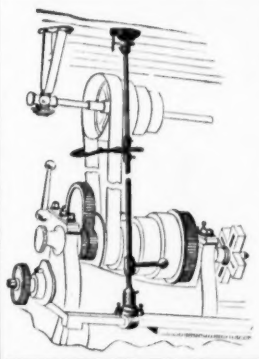

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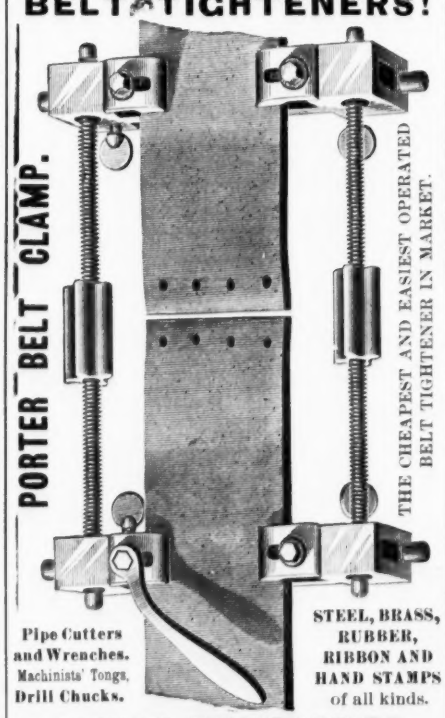

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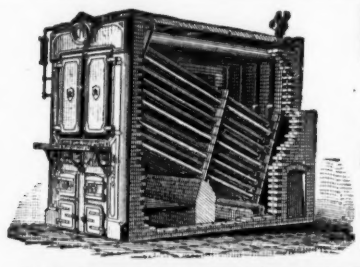

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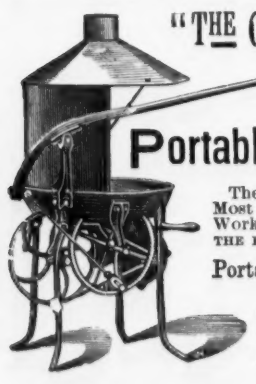

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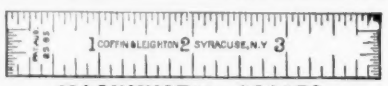

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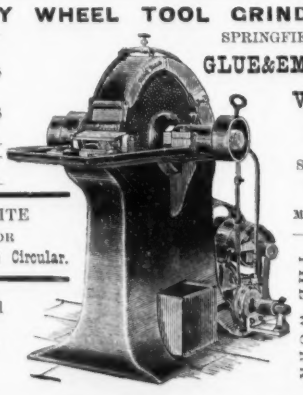

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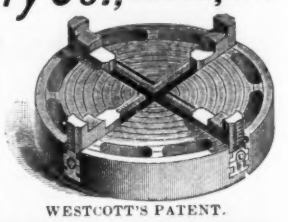

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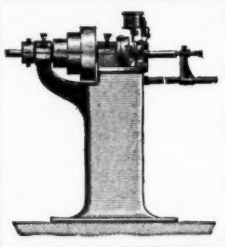

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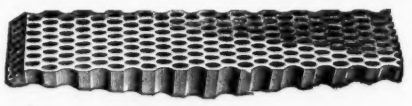

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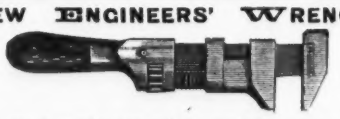

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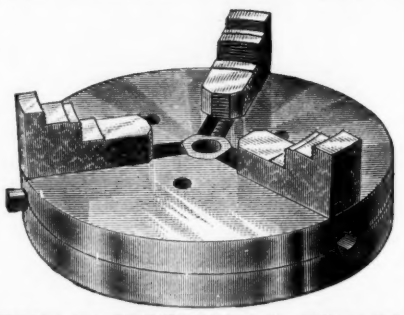

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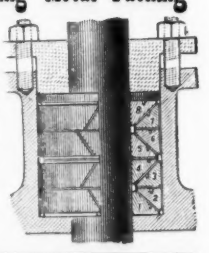

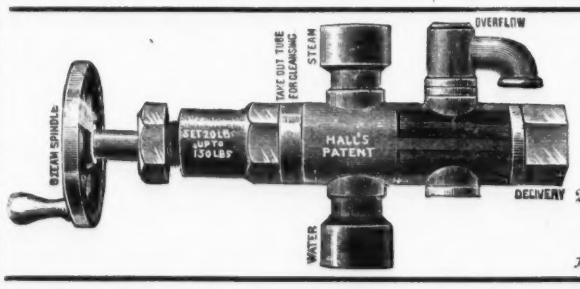

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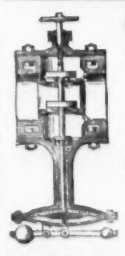

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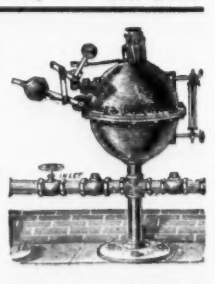

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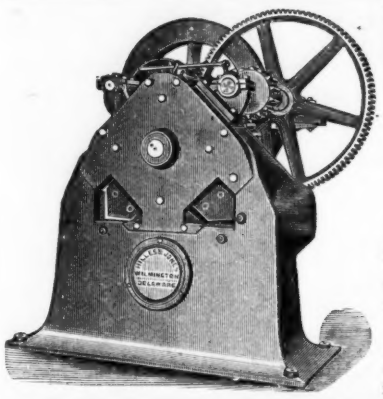

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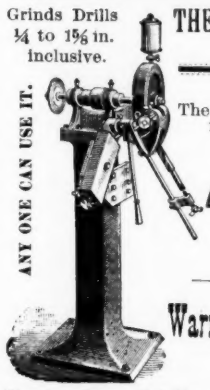

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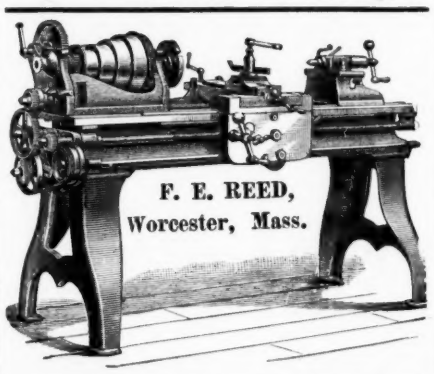

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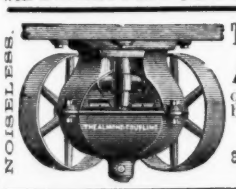

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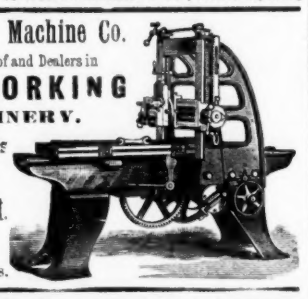

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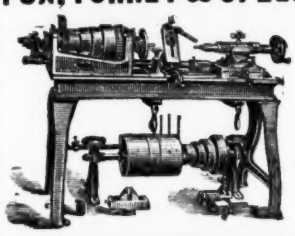

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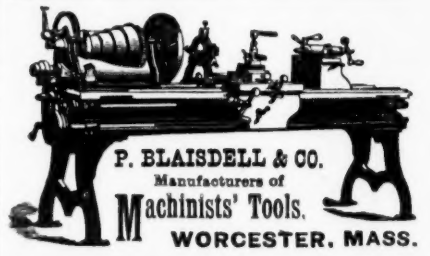

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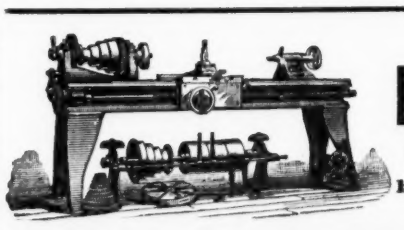

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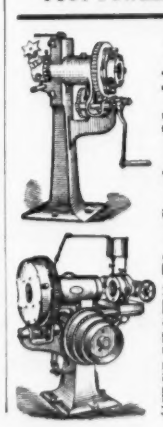

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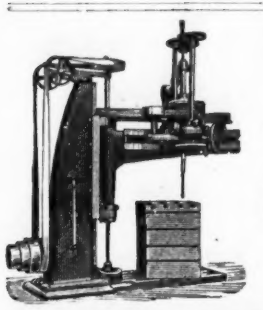

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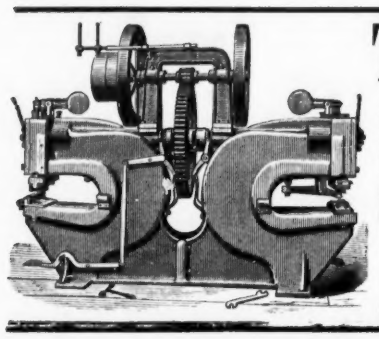

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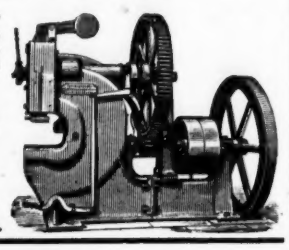

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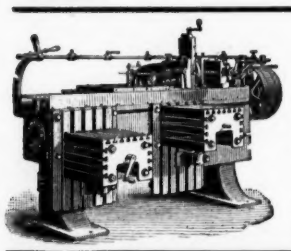

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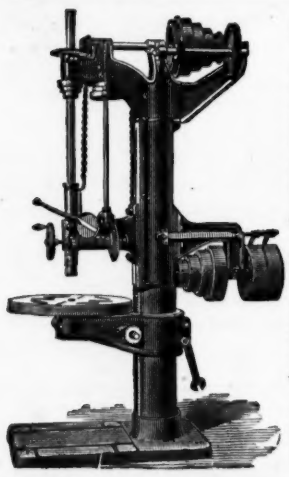

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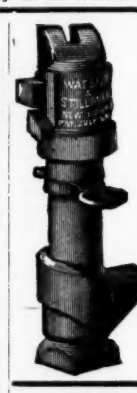

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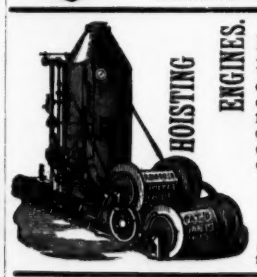

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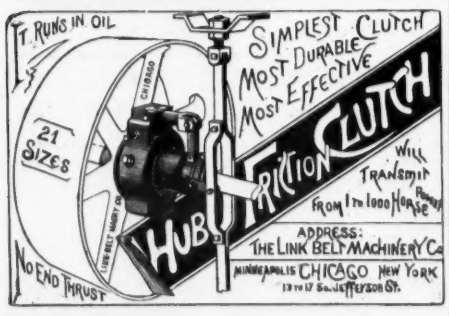

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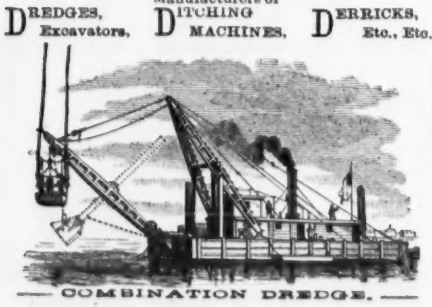

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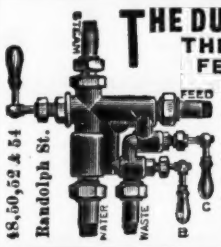

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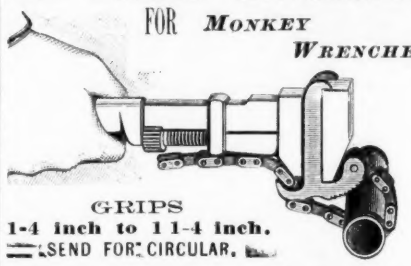

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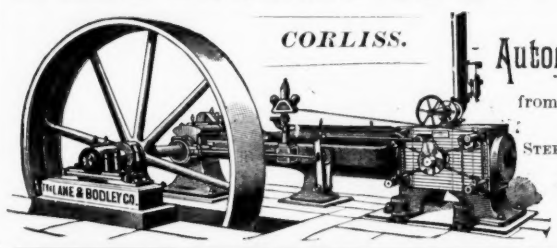

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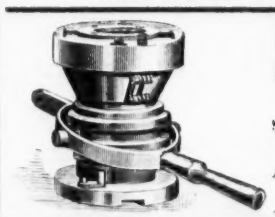

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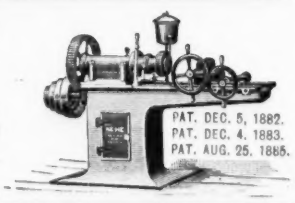

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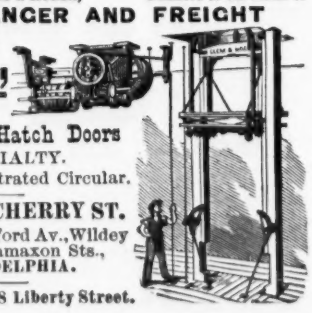

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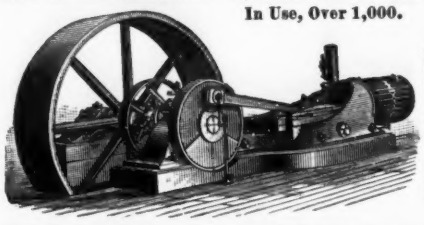

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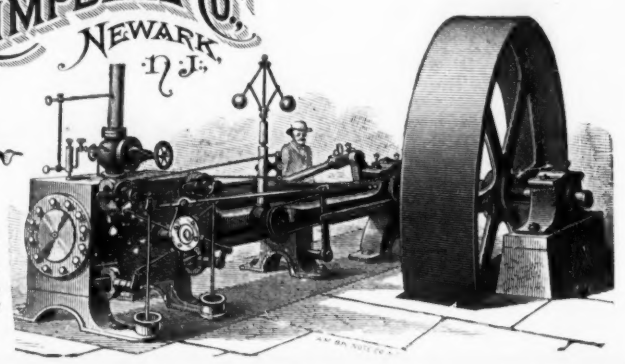

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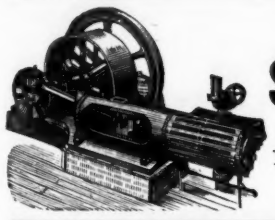

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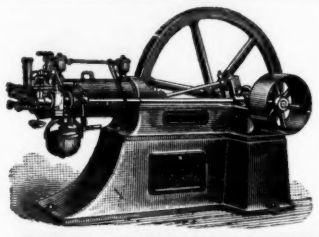

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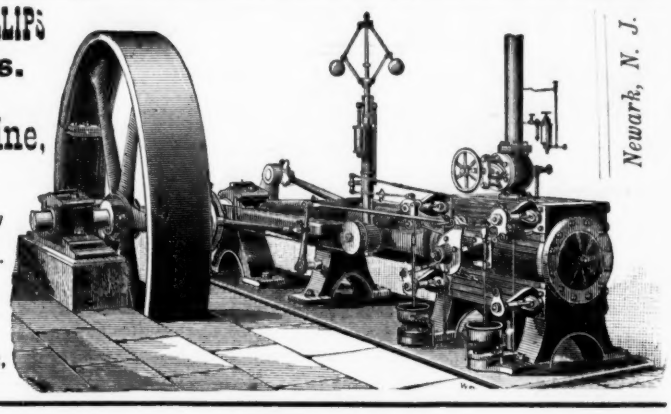

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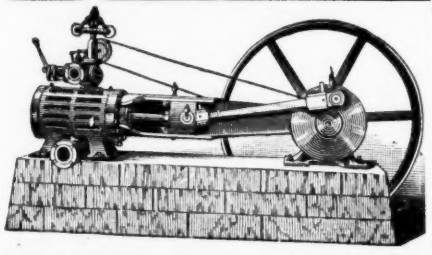

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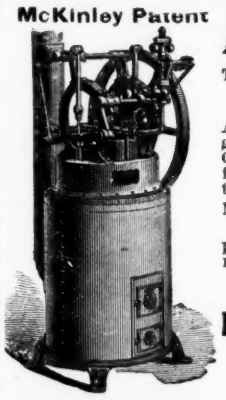

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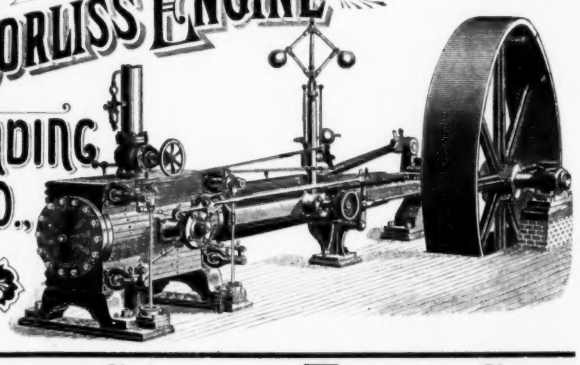

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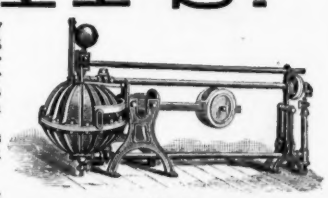

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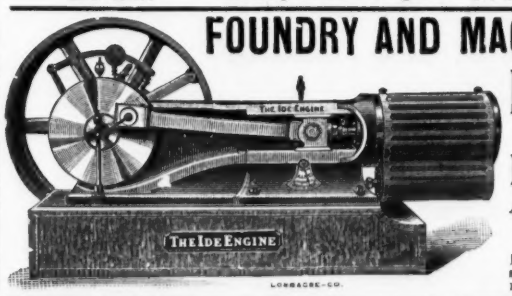

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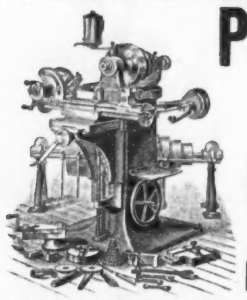

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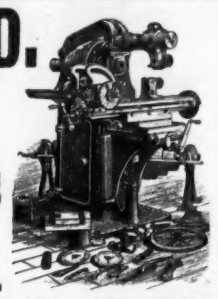

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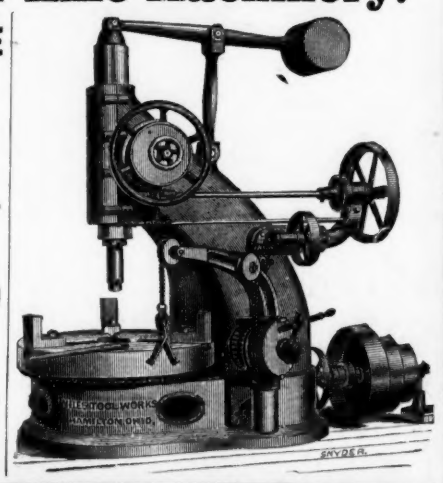

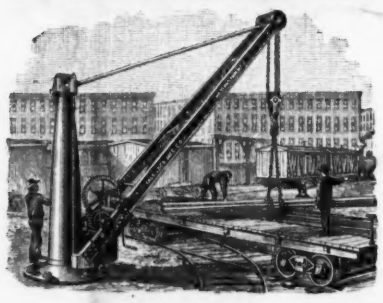

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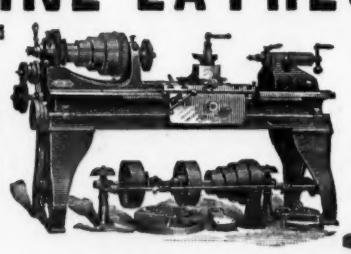

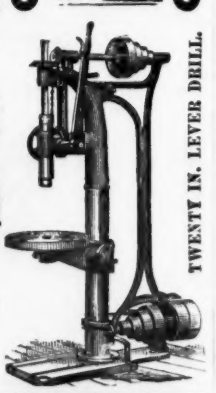

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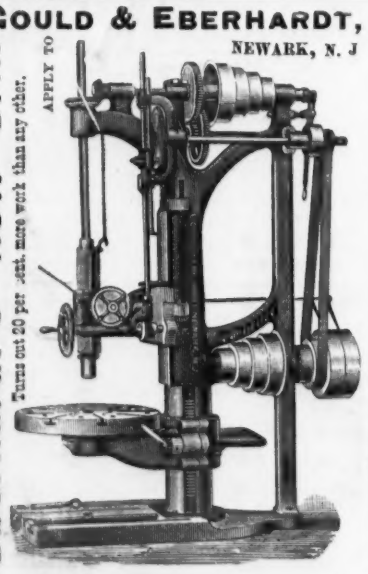

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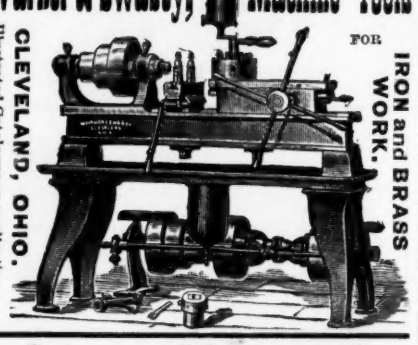

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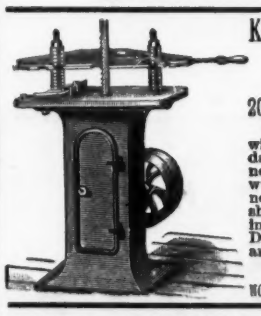

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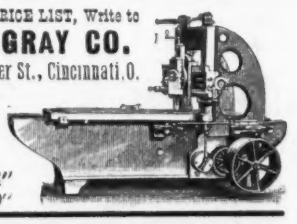

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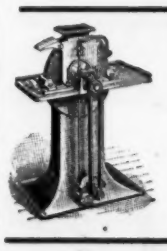

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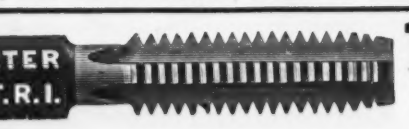

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